

**Groundwater Investigation Work Plan
MLC Site #1291 – Burton Parcel
Burton, Michigan**

**Motors Liquidation Company
Detroit, Michigan**

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Groundwater Investigation Work Plan MLC Site #1291 - Burton Parcel

3289 South Saginaw Street
Burton, Michigan

Prepared for: Motors Liquidation Company
Detroit, Michigan



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1. INTRODUCTION

Motors Liquidation Company (MLC), contracted O'Brien & Gere Engineers, Inc. (O'Brien & Gere) to prepare and implement a Work Plan for a groundwater investigation at the Burton Parcel (which overlaps the Hemphill Landfill) located on the corner of South Saginaw Street and Hemphill Road in Burton, Michigan. The location of the Burton Parcel Site is depicted on **Figure 1**. The Burton Parcel Site location in relation to the Hemphill Landfill is depicted on the Site Layout included as **Figure 2**.

The purpose of this Work Plan is to outline the proposed groundwater investigation and analytical activities to be performed at the Burton Parcel portion of the Hemphill Landfill. The investigation will be performed in accordance with the methods outlined in this Work Plan to assess groundwater flow conditions and quality at the Burton Parcel Site. This Work Plan also includes investigative derived waste management activities (Section 4.4), a site-specific Health and Safety Plan (HASP) included in **Appendix A**, and a site-specific Quality Control Document (QCD) included in **Appendix B**.

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2. SITE BACKGROUND AND SETTING

2.1 SITE DESCRIPTION

The Burton Parcel is located at the southeast corner of the South Saginaw Street and Hemphill Road intersection in Genesee County, Burton, Michigan. The Burton Parcel is located within Section 29 and 30 of Township 7 North, Range 7 East. A Site Location Map is included as **Figure 1** and a figure depicting the Burton Parcel Site and the Hemphill Landfill is included as **Figure 2**. The Burton Parcel contains the ten acre western portion of the Hemphill Landfill and is presently an unused lot with portions covered with asphalt or gravel. The Burton Parcel is bounded to the north by Hemphill Road, on the west by an active service station and South Saginaw Street, on the east by an open field (privately owned), and on the south by Westgate Plaza (commercial property).

Prior to 1941 the Burton Parcel property was used for agricultural purposes. As part of the municipal Hemphill Landfill, the Burton Parcel was filled with industrial and municipal wastes from sometime after 1941 to approximately 1958. Filling activities continued east of the Burton Parcel until 1978. The Burton Parcel property was used for commercial development beginning in 1955 with the construction of a building on the northern portion of the site occupied by Kroger. A second building, located in the central portion of the site occupied by Taystee Bread and a discount department store added to the building in 1959, was also formerly located on the property.

General Motors Corporation (GMC) purchased the property in 1978. Prior to GMC purchasing the property it was owned by the City of Burton. Remediation & Liability Management Company, Inc. (REALM), a wholly owned subsidiary of GMC, managed the Site from 2001 until 2009 when MLC assumed management of the property as part of the GMC bankruptcy process.

Previous investigations into the potential environmental impacts of the Burton Parcel property have been performed. A summary of these investigations is included in Section 2.2.

2.2 PREVIOUS SITE INVESTIGATIONS

Phase I, II, III, and IV investigations were performed at the Burton Parcel by Goldberg, Zoino & Associates (GZA) from September 1987 through May 1988. The Phase I & II investigations were performed from September 1987 through November 1987 and the Phase III and IV investigations were performed from February 1988 through May 1988. Assessment was performed in two phases. Phase I Assessment included a vadose zone monitoring program and a deep soil boring and monitoring well installation program. Based on the results of the Phase I Assessment, Phase II activities consisting of additional vadose zone and soil boring/monitoring well installations were performed in November 1987. The Phase III & IV investigations were performed at the Burton Parcel to further assess the results of the Phase I & II Assessment.

A geophysical survey was completed by WW Engineering & Science (WWES) and documented in a report dated January 1991.

The Michigan Department of Natural Resources (MDNR) collected soil and groundwater samples from the Burton Parcel in 1992 as part of a larger investigation associated with the Hemphill Landfill and Windiate Park investigations.

In November 1994 a Work Plan was prepared and submitted to the Michigan Department of Environmental Quality (MDEQ, formerly MDNR). The Work Plan presented quarterly groundwater sampling results and methods for assessing whether conditions at the Hemphill landfill could impact the nearby drainage ditch.

In November 1997, the results of an investigation at the Burton Parcel were documented and submitted to the MDEQ. The report summarized the investigation to assess the presence of subsurface waste fill at the Burton Parcel.

Based upon the results of the waste fill investigation, an additional investigation was performed to assess the extent of subsurface waste fill and assess potential reuse of the property. The results of this investigation were reported in March 2001.

Insight Environmental Services, Inc. (Insight) was retained by Genesee County to perform Phase I and Phase II Environmental Site Assessments (ESAs) to assess a smaller portion of the Burton Parcel property for the potential construction of a medical facility.

Sample locations associated with the abovementioned investigations are shown on **Figure 3**.

The following discussion summarizes each of these investigations:

2.2.1 Phase I Results

Thirteen vadose zone monitoring locations (V-177 through V-189) were sampled. Soil samples were collected from each location at a depth of six feet below grade (fbg) and screened for the presence of organic vapors using a photoionization detector (PID) and/or flame ionization detector (FID). Based on elevated readings with the PID, four locations were screened using a FID in an attempt to identify the compounds detected. The results of the FID screening indicated detections of compounds in some of the samples collected. To verify the field screening results, the bottom interval from three locations were submitted to an analytical laboratory for a gas chromatograph (GC) scan. Results from the GC scan indicated the presence of a variety of volatile organic compounds (VOCs) in the soil samples.

Additional investigation was performed as part of the Phase I investigation which included the installation of two deep soil borings (depths of 15 and 25 fbg) and one monitoring well. Soil samples collected from the deep soil borings were field screened using a PID and/or FID. Several of the soil samples screened indicated VOC readings above background and were collected at depths which correspond to the range in which waste fill materials were observed. Samples with elevated PID readings were screened using the FID. The results of the FID screening indicated the presence of VOCs in some of these samples.

The results of soil boring samples submitted for laboratory analysis indicated generally low concentrations of a variety of VOCs. Also, concentrations of selenium, zinc, and barium were detected in the soil samples. Groundwater samples collected from two of the borings were analyzed for VOCs at an analytical laboratory. The results of the analysis indicated VOCs were below method detection limits. GZA concluded that the range of compounds detected in the soil samples reflect the presence of paint, paint products, and possibly fuel oils within the waste fill material.

2.2.2 Phase II Results

Two additional deep soil borings (depths of 15 and 30 fbg) and one monitoring well were installed as part of this phase of investigation. Soil samples collected from the deep soil borings were field screened using a PID and/or FID. Several of the soil samples screened indicated VOC levels above background levels and were collected at depths which correspond to the range in which waste fill materials were observed. Samples with elevated PID readings were screened using the FID. The results of the FID screening indicated the presence of compounds in some of these samples some of these samples.

Soil samples from the monitoring well borings were analyzed for VOCs and metals. The analytical results indicated concentrations of several VOCs and detections of metals above background levels which include: barium, cadmium, copper, lead, selenium, and zinc. The analytical results of the groundwater sample collected from the monitoring well did not indicate concentrations of VOCs above method detection limits; however, dissolved concentrations of barium and selenium were detected above the maximum contaminant level (MCL) drinking water standard. GZA again concluded the concentrations observed in the soil were the result of paint or paint products possibly mixed with fuel oils in the waste fill material.

2.2.3 Phase III & IV Results

These phases of investigation were performed to assess the horizontal and vertical extent of elevated metals concentrations in soil, assess groundwater quality, and the extent of waste fill material at the Site. Soil borings

and three monitoring wells (MW-401, MW-402, and MW-403) were installed. The locations of the soil borings and monitoring wells are shown on **Figure 3**. Soil samples collected from the borings were submitted for analysis of five metals (barium, copper, lead, selenium, and zinc). These metals were in the highest concentrations for samples collected during the Phase I and II investigations. If total metals concentrations exceeded ten times the E.P. toxicity limit for that compound, the sample was analyzed using the E.P. toxicity procedure to assess the sample to respective hazardous waste criteria.

The results of the soil sampling indicated that total lead and total barium concentrations in most of the samples exceeded ten times the E.P. toxicity limit. Of the samples submitted for the E.P. toxicity procedure, three of the samples indicated concentrations which exceed hazardous waste criteria for lead.

Results of the analytical data for groundwater collected from the three monitoring wells indicated dissolved lead below the MCL; however, in two of the three wells, dissolved barium was higher than the MCL.

2.2.4 Geophysical Investigation Report

In September 1990, WWES was authorized by GMC to conduct a geophysical investigation on the Burton Parcel. The investigation results were summarized in a January 1991 Geophysical Investigation Report. Review of the geophysical report indicates that the Burton Parcel has several anomalies that are characteristic of areas that contain significant quantities of subsurface metallic debris or high soil conductivity. **Figure 3** depicts the location of the anomalies on the Burton Parcel. The magnetic data indicated the presence of four large anomalies and several smaller anomalies. The largest magnetic anomaly (located at the southeast) was interpreted by WWES as the remains of foundations or subsurface footings from a former building. WWES interpreted the two northern anomalies as areas of shallow metallic debris. WWES reported that the southwest anomaly may be caused by an underground pipeline.

2.2.5 MDNR Sampling - August 1992

The MDNR collected three soil samples and two groundwater samples from the Burton Parcel in August 1992. The groundwater samples were collected from two monitor wells, MW-401 and MW-2. The soil samples were submitted for laboratory analysis of select semivolatile organic compounds (SVOCs), VOCs, metals, pesticides and PCBs. The groundwater samples were analyzed for select SVOCs, VOCs and metals. Review of laboratory results indicate that soil samples collected from the Burton Parcel contained concentrations of select SVOCs, VOCs, metals, pesticides and polychlorinated biphenyls (PCBs) above MDNR site specific background levels. Site specific background levels were determined from laboratory analysis of two soil samples collected by the MDNR along Hemphill Road. Groundwater samples contained concentrations of select SVOCs, VOCs and metals above laboratory detection levels.

2.2.6 MDNR Sampling - November 1994

On November 16, 1994 the MDNR performed sampling at the Hemphill Landfill. O'Brien & Gere collected split samples at the same locations on behalf of GMC. The sampling involved the collection of three surface water samples (along the Schram drain), three sediment samples (each collected one foot below the bed of the drain in the locations where the surface water samples were collected) and five surface soil samples (collected at locations adjacent to the drain channel). These MDNR sample locations are shown on **Figure 3**. The samples were analyzed for the presence of PCBs, SVOCs, cyanide and metals. The analytical results for these analyses were below method detection limits or the most restrictive MDNR regulatory criteria.

2.2.7 Phase I Environmental Site Assessment

Insight was retained by Genesee County to perform a Phase I ESA for the Burton Parcel. It was anticipated that a smaller portion (2 to 3 acres) of the Burton Parcel would be acquired by Genesee County to construct a proposed Health Center. The purpose of the Phase I ESA was to identify Recognized Environmental Conditions (RECs) associated with the Burton Parcel. The Phase I ESA (dated June 11, 1999) identified several RECs associated with the surrounding properties and Burton Parcel; therefore, Genesee County retained Insight to perform a Phase II ESA investigation at the Burton Parcel.

2.2.8 Phase II Environmental Site Assessment

A Phase II ESA investigation was performed by Insight to assess RECs that may affect the portion of the Burton Parcel selected for the proposed Health Center and to determine whether this area (2.84-acre portion of the Burton Parcel) qualifies as a “facility” in accordance with the Natural Resources and Environmental Protection Act (NREPA), PA 451, Part 201. The Phase II ESA investigation activities were performed in accordance with a Phase II ESA Work Plan dated April 9, 1999. The Phase II investigation included the installation of eleven hydraulic probe borings, soil sample collection from the borings and soil sample analysis, and temporary well installation and groundwater sampling. Results of the Phase II investigation indicated concentrations of constituents were detected below MDEQ Part 201 Residential criteria; therefore, the 2.84 acre portion of the Burton Parcel did not meet the MDEQ definition of a “facility”.

REALM sent a letter to the MDEQ requesting re-designation of Parcel B2 (shown on **Figure 2**) as not being a “facility” as defined under NREPA 1994, PA 451 Part 201. The MDEQ responded with a letter dated November 17, 1999 denying this request based on concentrations of benzene and strontium in soil samples collected from the northern portion of the proposed Parcel B2 above MDEQ Generic Residential criteria; therefore, REALM re-divided the parcel to not include the area of impacted soil at the northern portion of Parcel B2. A letter was submitted to the MDEQ dated November 28, 2000 requesting the newly defined Parcel B2 not be considered a “facility”. The MDEQ issued a letter dated December 19, 2000 indicating Parcel B2 was not a “facility” and has not been impacted by the operation of the Hemphill Landfill facility.

2.2.9 Hemphill Landfill Investigation Work Plan

The objective of the November 1994 Work Plan was to develop data which would allow an evaluation as to whether existing conditions at the Hemphill Landfill could impact the drainage ditch to the east. The Work Plan was not implemented since O’Brien & Gere split samples with the MDNR during the 1992 surface water and sediment sampling event.

The O’Brien & Gere Work Plan also presented the 1993 to 1994 quarterly laboratory results of water samples collected from two existing monitor wells identified as MW-401 and MW-403. The monitor wells are located in the southeast corner of the Burton Parcel and are depicted on **Figure 3**. Laboratory results indicate that the groundwater at the site has been impacted by select VOCs and dissolved metals, which include barium, lead, zinc, arsenic and selenium.

2.2.10 Burton Parcel Investigation Report

The November 1997 O’Brien & Gere Final Report on the Burton Parcel investigation contains an assessment of the extent of the subsurface waste material that is located at the Burton Parcel. During the assessment, O’Brien & Gere installed 27 shallow soil borings (OBG SB-1 through OBG SB-27), and two deep soil borings (OBG SB-1D and OBG SB-2D) shown on **Figure 3**. One soil sample was collected from each boring and three groundwater samples were collected from three selected borings. Soil analytical results indicated that select concentrations of VOCs were detected above MDEQ Generic Residential twenty times drinking water values. Lead was detected in four of the soil samples above the MDEQ Generic Commercial Subcategory IV Cleanup criteria. Groundwater laboratory results indicated that concentrations of total lead and total arsenic were detected above the MDEQ Generic Commercial Health Based Drinking Water value.

2.2.11 Burton Parcel Additional Investigation

An additional investigation (report dated March 2001) was performed at the Burton Parcel subsequent to the initial investigation, to further assess the extent of waste fill at the property and assess the potential reuse of the property. This investigation included the installation of sixteen soil borings (OBG SB-28 through OBG SB-43) with soil and groundwater samples collected from the borings. The boring locations are depicted on **Figure 3**. Attempts to collect groundwater samples were made at boring locations in which conditions appeared favorable. Groundwater samples were collected at the following seven soil borings: OBG SB-28, OBG SB-30, OBG SB-32, OBG SB-33, OBG SB-34, OBG SB-42 and OBG SB-43. Soil analytical results indicated concentrations of benzene were detected above the MDEQ Generic Commercial Drinking Water Protection criteria in three

samples. Groundwater results indicated concentrations of benzene, ethylbenzene, and xylenes above the MDEQ Generic Commercial Drinking Water criteria.

2.2.12 Groundwater Monitoring Reports

A groundwater sampling program began in May 1996 as a result of the GZA investigations, and was performed through March 2005 for on-site wells MW-401 and MW-403 (depicted on **Figure 3**). Historically, various VOCs primarily benzene, toluene, ethylbenzene and xylenes (BTEX), and dissolved inorganics (arsenic, barium, lead and zinc) have been detected at concentrations above Michigan Department of Natural Resources and Environment (MDNRE, formerly MDEQ) Generic Industrial Drinking Water criteria. Also, a measurable amount of free product was observed a few times in well MW-401.

The most recent groundwater results (March 10, 2004) indicate a detection of ethylbenzene at MW-401 above the MDNRE Generic Industrial Drinking Water criteria and intermittent detections of dissolved barium and zinc above this criteria in both wells. **Table 1** summarizes the groundwater monitoring results.

No groundwater samples were collected during the four quarterly sampling events conducted after March 2004, based on groundwater sampling protocols prohibiting the collection of samples when a sheen was observed on the purge water. Therefore, in the transmission (November 4, 2005) of the Third Quarter 2005 Groundwater Sampling Report, REALM indicated the groundwater sampling program would be terminated. Additional discussion regarding regulatory communications is summarized in the following section.

2.3 MDEQ CORRESPONDENCE

Upon the MDEQ receiving the request to terminate the groundwater sampling program at the Burton Parcel, the MDEQ sent a letter to REALM dated November 29, 2005. This letter requested a meeting with REALM to discuss the submission of a schedule to assess the nature and extent of the impact to the east and south of the Burton Parcel.

A meeting was held with the MDEQ on February 9, 2006. At this meeting the MDEQ indicated they believe GMC filled in their property (Burton Parcel) and further east offsite. The MDEQ also indicated that based on the filing of the Notice of Offsite Migration Form (submitted April 30, 2003) indicating the possibility that contamination was migrating from the Burton Parcel onto adjoining properties, and groundwater flow conditions must be assessed on the Burton Parcel. MDEQ also requested GMC send a letter documenting/identifying any potentially responsible parties (PRPs) which may have filled the Hemphill Landfill, and prepare a Work Plan to investigate groundwater flow conditions. REALM responded with a letter dated August 16, 2006 to the MDEQ, identifying the City of Burton as a PRP based on historical documentation including Proceedings of the Board of Supervisors of Genesee County (1940-1944). This letter also informed the MDEQ of REALM's intent to submit a Work Plan for the investigation of groundwater flow at the Burton Parcel. The MDEQ responded with a letter dated September 18, 2006 citing NREPA, Act 451, Part 201, Section 29 "it is the responsibility of the party asserting a division of harm to prove it is divisible."

2.4 GEOLOGIC SETTING

2.4.1 Regional Geology

Glacial till deposits in Genesee County are approximately 100 to 200 ft thick in the eastern section of the county and 50 to 100 ft thick in the western section. The drift is predominantly clay/till with isolated lenses of sand and/or gravel.

A confining unit exists in the area based on review of water well records. A review of water well records indicates the confining unit is a blue/grey clay and generally exists at 12 to 135 fbg with thicknesses ranging from 30 to 150 ft.

Stratigraphically the area is part of the Michigan Basin, which is a relatively shallow, intracratonic structure that includes the Lower Peninsula, part of the Upper Peninsula, and parts of Wisconsin, Illinois, Indiana, Ohio, and

Ontario. The topography of the bedrock surface in Genesee County ranges from 600 to 700 ft above mean sea level (MSL).

The predominant underlying bedrock in Genesee County is the Saginaw Formation. The Saginaw Formation has a maximum thickness of 765 ft, as reported from well logs collected in the Michigan Basin (MDEQ 1978). In Genesee County the Saginaw Formation is thickest (100 to 200 ft) in the Northwestern part of the county. The formation thins and finally pinches out in the east and southeastern parts of the county. The Saginaw Formation is generally composed of interbedded sandstones, shales, limestone, and coal.

Underlying the Saginaw are the Michigan Formation and the Marshall Sandstone. The Michigan Formation is the underlying bedrock in eastern Genesee County in areas where the Saginaw Formation has thinned out. The Michigan Formation is composed of beds of anhydrite and gypsum, gray to dark gray and greenish-gray shale, limestone, dolomite, and sandstone. A sand unit of the Michigan Formation, called the Michigan "Stray Sandstone" is reported to be a potential source for large quantities of natural gas. The Michigan Formation is approximately 50 to 200 ft thick in Genesee County. The Marshall Sandstone underlies the Michigan Formation and consists of sandstone and siltstone with some zones exhibiting red coloration. The Michigan Formation thins out south of Genesee County and is replaced by Marshall Sandstone as the uppermost bedrock formation underlying the glacial drift. The Marshall Sandstone is the major water-bearing unit.

2.4.2 Site Geology

Discussion of the Site geology is limited to the uppermost 53 ft of unconsolidated material observed during soil boring installation. Overburden materials consist of intermixed soils and waste fill material. In general, the Site is covered by asphalt and gravel parking areas. Subsurface materials encountered during drilling activities include silt, sand, clay, and waste fill material in various amounts across the Site. A north-south (A-A') geologic cross section which depicts the relationship of subsurface materials at the Burton Parcel is included as **Figure 4**.

Fill material which consisted of glass, fabric, concrete, carpet, rubber, vinyl, degraded asphalt, wood block, fencing, and cardboard was observed in the borings and was mixed with soil material. Approximate thicknesses of waste fill material are identified in **Table 2** along with the depth below grade. The approximate horizontal extent of subsurface waste fill material observed at the Burton Parcel is depicted on **Figure 2**.

2.4.3 Regional Hydrogeology

Genesee County is located on the border of usable groundwater from Mississippian formations (Marshall Sandstone) and Pennsylvanian (Saginaw) formations. At the western edge of Genesee County, well sampling efforts have documented that the total dissolved solid (TDS) levels in these formations are as high as 100,000 mg/l. The glacial drift also has been shown to have elevated levels of TDS. The brine content of these formations diminishes to the east, away from the center of the Michigan Basin. The regional groundwater flow in the Saginaw Formation and Mississippian formations is to the northwest. Well logs provided by the Genesee County Health Department indicate that usable groundwater is encountered in the area at approximately 200 ft below land surface.

A small portion of the domestic wells in Genesee County are installed in discontinuous sand and gravel beds within the glacial drift. A larger portion of the wells are installed in bedrock formations, typically the Marshall Sandstone.

2.4.4 Site Hydrogeology

Groundwater flow data from previous investigations at the Site indicate a northern groundwater gradient. Previously, O'Brien & Gere made a freedom of information request to the MDNR in order to obtain information on a former Marathon service station (known to have been a petroleum leak site - site ID # 250469) located at the intersection of South Saginaw and Atherton Streets. Groundwater monitoring information provided for this site by the MDNR confirmed a northern groundwater gradient for shallow groundwater in the area.

Previous investigations performed at the Burton Parcel indicate shallow groundwater observed at depths from approximately 10 to 15 fbg located at the northern and western portions of the property in discontinuous sand

seams and a shallow sand unit which was observed at the Site. Deeper groundwater was observed in the two deep soil borings (OBG SB-1D and OBG SB-2D, shown on **Figure 3**) installed at the Site at approximately 25 fbg.

3. WORK PLAN COMPONENTS

3.1 WORK PLAN

This Work Plan contains a description of the investigation tasks to be performed at the Burton Parcel, as well as details regarding well locations and analyses. Detailed discussion on specific sample collection methods is included in Section 4. Analytical methods are described in the QCD, included in **Appendix B**.

3.2 SITE HEALTH AND SAFETY PLAN

A site-specific HASP has been prepared in accordance with 20 CFR 1910.120 and the MLC Health and Safety Guidelines. The HASP also specifies protective measures and procedures to be followed by investigators and site visitors to minimize exposure to site-related materials. The HASP for this project is included as **Appendix A** of this Work Plan.

3.3 QUALITY CONTROL, DOCUMENT

A QCD has been prepared using guidance provided in the United States Environmental Protection Agency (USEPA) *Requirements for Quality Assurance Project Plans For Environmental Data Operations, EPA QA/R-5* (USEPA 2001). The QCD describes protocols necessary to achieve the data quality objectives. The QCD applies to the Burton Parcel groundwater investigation. The QCD for this site is included as **Appendix B** of this Work Plan.

3.4 DATA VALIDATION

Data quality and usability will be evaluated through Level II partial validation. This validation will be performed in accordance with the QCD, including an evaluation of primary quality control criteria. This review does not include raw checks; however, the validator may manually change the analytical results and/or apply qualifiers to the data. A Level II partial validation report will be provided to document the data quality and overall usability of the data.

3.5 DATA MANAGEMENT

Electronic analytical data will be provided and incorporated into an EquiS® database program. This database will be linked to a geographic information system (GIS) to allow for numerical and graphical representations of the data. Changes or qualifiers provided by the validator will be incorporated into the database.

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4. FIELD SAMPLING PLAN

This section provides specific field sampling procedures to be used during implementation of the Burton Parcel groundwater investigation.

4.1 UTILITY CLEARANCE

Prior to performing the investigation, an underground utility survey of the Burton Parcel will be performed to assist in placing sample locations. This survey will include review of existing files, gathering information from public utility companies, and reviewing the City of Burton records.

Field activities that penetrate the ground surface (*i.e.*, well installations) will have a utility clearance performed in advance of subsurface work. Prior to marking the proposed groundwater monitoring well locations, information regarding underground utilities and structures will be obtained and reviewed. Using this information, the site will be visually inspected for physical evidence of buried lines or structures, including pavement cuts and patches, variation in or lack of vegetation, variations in grading, *etc.* Evidence of buried utilities will be documented. The public underground locating service (MISS DIG) will be contacted to request underground utility marking around the Burton Parcel, three days prior to commencing drilling work. To confirm the absence of underground utilities, a boring will be hand-augered five ft at each proposed well location.

Overhead utilities will also be observed and noted. If groundwater monitoring wells are to be installed beneath overhead utility lines, minimum clearance requirements will be evaluated.

Using the information obtained, proposed groundwater monitoring well locations will be marked in the field using spray paint.

4.2 GROUNDWATER MONITORING POINT INSTALLATION AND DEVELOPMENT

Soil borings will be installed in accordance with this Work Plan and the O'Brien & Gere Protocol included in **Appendix C**, using a Rotosonic® drill rig. A Rotosonic® drill rig operates similar to a conventional top-drive rotary or auger rig. This drilling system employs simultaneous high frequency vibration and low speed rotational motion along with down pressure to advance the cutting shoes of the drill string. This technique provides a continuous soil core and generates minimal cuttings. The soil core will start from the ground surface and continue to the bottom of the boring.

Drilling operations take place from the drill platform, which is about four ft above ground. Steel drill casing and core barrel are connected to the head from the work platform/support truck and are then hoisted to vertical in the derrick. Tool joints are connected and disconnected by a hydraulic vise/wrench that is in the base of the derrick. The Rotosonic® head is able to pivot 90 degrees making connection of the rods easier and safer.

The Rotosonic® drilling system uses an override core barrel system. A 4-in or 6-in diameter, 10-ft long core barrel is first advanced 10 ft into the ground. This is followed by the override casing drilled to the same depth as the core barrel cutting shoe. The core barrel is then removed and two 5 ft soil samples are extruded into plastic sleeves. The core barrel is sent back down the hole where it is advanced another 10 ft followed again by the override casing. The outer casing minimizes cross contamination and formation mixing and allows for a controlled placement of wells.

O'Brien & Gere will install up to five shallow (approximately 15 fbg) and up to six deep (25 to 45 fbg) monitoring wells to assess site-specific groundwater flow conditions and potential impact to groundwater. The locations of the proposed monitoring wells are shown on **Figure 5**. Two groundwater monitoring wells have previously been installed at the Burton Parcel and are also depicted on **Figure 5**. This previous data is discussed in Section 2 of this Work Plan.

An O'Brien & Gere geologist will be on-site during well advancement to describe soil samples. Additionally, soils will be screened using a PID. The geologist will place one representative sample from each soil core section for PID headspace screening.

Due to the true continuous sampling of the system, accurate depictions of the stratigraphy and lithology of the overburden are obtained (minimal sloughing). Therefore, at the four locations (depicted on **Figure 5**) where a shallow and deep well location are proposed, the deep soil boring will be installed first and that subsurface information will be used to install the shallow well without continuous sampling performed. Additionally, few cuttings are mobilized to the surface. Most of the formation material enters the core barrel, except small amounts, that are pushed into the borehole wall. Soil cuttings will be contained in 55-gal Department of Transportation (DOT)-approved drums and staged on site pending final disposal. Additional discussion on waste a management is included in Section 4.4.

Subsequent to soil sampling, monitoring wells will be installed in accordance with the following methods: monitoring wells will be installed through the override casing that extends to the bottom of the boring. The monitoring wells will be constructed of 2-in diameter flush-joint PVC casing and a 5-ft length of 0.010-in slot PVC well screen. The well screen and riser assembly will be placed into the casing to the desired depth and a washed graded silica sand pack will be placed around the well screen and shall extend a minimum of one ft above the top of the screen. Coarse granular bentonite will then be added to the annular space to approximately two ft above the sand pack. The override casing will be retracted as appropriate during sand pack and bentonite placement. A cement/bentonite grout will then be added during the extraction of the remaining override casings to just below grade where the monitoring wells will be completed. Either a standup protective casing or flushmount roadbox will be installed over the monitoring wells. A weep hole will be drilled in the bottom of the standup protective casing to allow any accumulated water to drain. The monitoring well identification will be clearly marked on the inside and the outside of the protective casing cap.

Newly installed monitoring wells will be developed to remove fine-grained materials that may have entered the well or sand pack during construction. The monitoring well will be pumped until the water is relatively silt-free or no further change is noted; and the temperature, pH, turbidity, and specific electrical conductance readings have stabilized to within ten percent or until the well produces relatively clear, sediment-free water, to the extent practical. Groundwater will be collected in a glass jar to evaluate relative turbidity and to measure and record temperature, pH, turbidity, and specific electrical conductance.

Prior to well development, the equipment that will enter the monitoring well will be cleaned using a laboratory grade detergent and tap water rinse, or steam cleaned. Well development water will be discharged to the ground surface near the well. Additional discussion on waste a management is included in Section 4.4.

Subsequent to monitoring well installation, a location and elevation survey will be performed to establish top-of-casing and grade elevations for the newly installed wells and existing wells MW-401 and MW-403 wells. Horizontal locations will also be surveyed for the on-site well network.

4.3 GROUNDWATER SAMPLING – LOW FLOW PURGING

Subsequent to installation, O'Brien & Gere will collect groundwater samples from the up to 11 newly installed monitoring wells (**Figure 5**). Groundwater sampling will include low-flow sampling techniques. Groundwater samples will be analyzed for the presence of VOCs, total arsenic, total barium, total lead, and total zinc. Existing monitoring wells MW-401 and MW-403 will not be sampled because they were constructed with screen lengths of 20 ft and 30 ft, respectively.

Groundwater samples will be collected using the low flow/low stress sampling technique as described in the O'Brien & Gere protocol (**Appendix E**) in this Work Plan. Low flow/low stress sampling techniques minimize the presence of fine grain materials in the groundwater samples. Since some constituents are known to have an affinity for fine-grained particulates (*i.e.*, inorganic constituents), samples collected using low flow/low stress techniques are typically more representative of the groundwater quality in the aquifer than samples collected using a hand bailer.

Prior to set up, the well identification and location will be verified using location layout drawings and the condition of the well will be noted in the field logbook.

Prior to purging, a water level and total well depth will be measured and recorded. To purge the monitoring well using low flow/low stress techniques, a bladder pump/submersible variable rate pump, or a peristaltic pump will be used. The pump, safety cable, tubing, and electrical lines will be lowered into the well. Before starting the pump, the water level will be measured with the pump in the well and the measuring device will be left in the well after completing the measurement.

The well will then be purged at 100 to a maximum of 500 milliliters per minute (mL/min). During purging, the water level will be monitored every five minutes, or as necessary to maintain a steady flow rate that results in drawdown of 0.3 ft or less. Field indicator parameters (pH, temperature, conductivity, oxidation-reduction potential (ORP), dissolved oxygen (DO), and turbidity) will also be monitored approximately every five minutes. Water level and field indicator parameter measurements will be documented on the groundwater field sampling log form.

The well will be considered stabilized when the physical parameters are within ten per cent for three consecutive readings for each parameter. If stabilization is not achieved for the field parameters, purging will be continued until a maximum of three well screen volumes have been purged from the well. If turbidity readings do not stabilize below readings of 20 NTUs, a dissolved metals sample will be collected.

Samples will then be collected directly from the pump with the groundwater discharged directly into the appropriate sample container. Samples will be collected at a flow rate between 100 to 250 mL/min and such that drawdown of the water level in the well does not exceed the maximum allowable drawdown of 0.3 feet.

If drawdowns of 0.3 ft or less cannot be maintained because of the permeability of the formation at a particular well location, "ultra-low flow" purge techniques will be employed. Ultra-low flow purge rates are rates below 100 ml/min; however, if ultra-low flow purging still results in well purging "dry", the well will be allowed to recharge for the balance of the day. As a sufficient volume of water enters the well, field parameter measurements will be collected and purging will continue up to a maximum of 24 hours from the beginning of purging, at which time the groundwater sample from the well will be collected.

Samples will be collected in the following order: VOCs, dissolved metals (if necessary), total metals.

The pumping rate used to collect VOC samples will not exceed 100 mL/min. VOC samples will be discharged directly to 40 mL glass vials with no headspace and topped with a teflon cap. Once capped, the vials will be checked for air bubbles. If bubbles are observed in the sample vial, a new sample vial will be used to collect a replacement sample. Following sample collection, samples will be placed in a cooler with ice.

Investigation derived wastes will be handled as described in Section 4.4.

4.4 INVESTIGATION-DERIVED WASTES

Investigation-derived waste (IDW) will consist of soil cuttings from soil boring installation, and monitoring well installation; groundwater from well development, purging and sampling activities; personal protective equipment (PPE) (*i.e.*, spent gloves, personal protection equipment); decontamination water/fluids; and disposable sampling equipment.

Soil cuttings will be contained in 55-gallon DOT-approved steel drums. Drums will be labeled with the date of generation, the source of the soils (*i.e.*, the boring or well identification number), and other information as required by the disposal facility/waste hauler. A composite soil characterization sample will be collected from the drums. Analyses of the soil characterization sample will be based on the past soil and groundwater analytical sample results and the requirements of the off-site disposal facility.

Free liquid (*i.e.*, groundwater, decontamination fluids, and development fluids) will be discharged to the ground surface.

PPE and disposable sampling equipment will be containerized and labeled. Following review of the environmental samples, PPE and disposable sampling equipment may be disposed as municipal trash, if appropriate.

Based upon receipt of waste characterization results, O'Brien & Gere will coordinate disposal with a licensed waste hauler. Wastes generated at the site are assumed to be non-hazardous.

4.5 EQUIPMENT DECONTAMINATION

Field equipment potentially exposed to contaminants will be properly decontaminated as described in this Work Plan.

4.5.1 Drill Rig and Heavy Equipment

Equipment and materials associated with sampling must be cleaned before and after use at a site and between discrete investigation locations. Items such as drill rigs, drill rods, and miscellaneous heavy equipment present potential sources of interference to environmental samples. These items will be cleaned using high-pressure steam cleaning methods.

4.5.2 Decontamination of Sampling Equipment

Decontamination procedures are designed to remove particles and compounds that could affect the integrity of samples, and thus, the interpretation of environmental sampling data. The following decontamination procedure will be followed for sampling equipment:

- Brush loose soil off equipment
- Wash equipment with laboratory grade detergent (*i.e.*, Alconox or equivalent)
- Rinse with potable water
- Allow water to evaporate before reusing equipment.

For decontamination of submersible pumps used for groundwater sampling, the following procedure will be followed:

- Remove the pump from the well and decontaminate the external casing and associated wiring.
- Pump solution (approximately five gallons) of potable water and non-phosphate detergent through the pump
- Pump clean potable water through pump
- Pump distilled water through pump
- Return the pump to a covered storage container.

4.6 DATA RECORDING – FIELD BOOKS

Field work performed as part of the Burton Parcel groundwater investigation will be recorded in a hardcover, bound field logbook. Typical field data will include, but will not be limited to, the following:

- General field observations
- Numeric field measurements and instrument readings
- Activity dates
- Sample locations and corresponding sample identification numbers
- Relevant comments and details pertaining to the sample collected
- Documentation of activities, procedures, and progress achieved
- Weather conditions
- A listing of personnel involved in site-related activities.

During groundwater sampling using low flow purging methods, field data will be recorded on a groundwater field-sampling log.

5. REPORT PREPARATION

Upon receipt of validated data associated with the groundwater investigation, a brief report will be prepared summarizing the groundwater analytical data and assessing groundwater flow conditions for the Burton Parcel. The report will include maps with groundwater contours and analytical results, tables summarizing analytical data, soil boring logs and monitoring well construction details. This report will be submitted to the MDNRE.

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Table 1
Motors Liquidation Company
Burton Parcel

Historical Groundwater Analytical Exceedences

Sample Location	Sample Date	Benzene	Ethylbenzene	Xylenes (Total)	Methylene Chloride	1,2,4-Trimethylbenzene	Dissolved Arsenic	Dissolved Barium	Dissolved Lead	Dissolved Zinc
MDNRE Criteria										
Residential & Commercial I Drinking Water		5 (A)	74 (E)	280 (E)	5 (A)	63 (E)	10 (A)	2,000 (A)	4 (L)	2,400
Industrial & Commercial, II, III & IV Drinking Water		5 (A)	74 (E)	280 (E)	5 (A)	63 (E)	10 (A)	2,000 (A)	4 (L)	5,000 (E)
Residential Groundwater Contact Criteria		11,000	110,000	190,000	220,000	56,000 (S)	4,300	1E+07	ID	1E+08
MW-401	3/10/2004	--	106	171	ND	35	--	1,680	ND	2,020
MW-401	9/30/2003	--	124	206	ND	37	--	1,430	ND	1,600
MW-401	6/20/2003	--	124	202	ND	42	--	1,490	ND	1,820
MW-401	9/12/2002	--	100	160	ND	35	--	1,600	ND	2,040
MW-401	6/27/2002	--	110	204	ND	46	--	1,400	ND	1,890
MW-401	12/27/2001	--	420	680	ND	80	--	2,140	ND	4,510
MW-401	10/1/2001	--	200	400	ND	40	--	1,780	ND	2,800
MW-401	3/28/2001	--	260	400	70	80	--	2,920	ND	2,390
MW-401	10/30/2000	--	160	280	ND	50	--	2,140	3	4,020
MW-401	4/13/2000	--	5	6	ND	ND	--	3,540	ND	40
MW-401	2/22/2000	--	760	155	ND	35	--	2,590	ND	5,330
MW-401	8/12/1999	--	110	160	ND	ND	--	2,220	ND	4,800
MW-401	5/3/1999	--	261	531	ND	87	--	3,170	ND	4,500
MW-401	11/4/1998	--	202	423	ND	ND	--	2,170	ND	4,820
MW-401	8/6/1998	--	340	830	ND	ND	--	2,700	308	10,200
MW-401	2/12/1998	--	340	690	NA	NA	--	3,350	3	10,700
MW-401	11/4/1997	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-401	5/8/1997	--	ND	ND	NA	NA	--	2,490	ND	12,000
MW-401	11/20/96	--	456	802	NA	NA	--	2,700	4	19,400
MW-401	07/23/96	--	2,600	2,700	NA	NA	--	5,600	11	20,000

See page 2 for notes.

Table 1
Motors Liquidation Company
Burton Parcel

Historical Groundwater Analytical Exceedences

MDNRE Criteria	Benzene	Ethylbenzene	Xylenes (Total)	Methylene Chloride	1,2,4-Trimeethylbenzene	Dissolved Arsenic	Dissolved Barium	Dissolved Lead	Dissolved Zinc
Residential & Commercial I Drinking Water	5 (A)	74 (E)	280 (E)	5 (A)	63 (E)	10 (A)	2,000 (A)	4 (L)	2,400
Industrial & Commercial, II, III & IV Drinking Water	5 (A)	74 (E)	280 (E)	5 (A)	63 (E)	10 (A)	2,000 (A)	4 (L)	5,000 (E)
Residential Groundwater Contact Criteria	11,000	110,000	190,000	220,000	56,000 (S)	4,300	1.0E+07	ID	1.0E+08
MW-403 12/16/2003	ND	ND	--	--	--	--	3,310	--	70
MW-403 9/19/2003	ND	ND	--	--	--	--	3,280	--	256
MW-403 12/31/2002	ND	70	--	--	--	--	1,970	--	2,840
MW-403 9/12/2002	ND	1	--	--	--	--	2,700	--	33
MW-403 4/4/2002	ND	ND	--	--	--	--	2,810	--	20
MW-403 12/27/2001	ND	1	--	--	--	--	2,880	--	40
MW-403 7/2/2001	ND	ND	--	--	--	--	2,840	--	30
MW-403 7/2/2001	ND	ND	--	--	--	--	2,790	--	40
MW-403 10/30/2000	2	2	--	--	--	--	3,550	--	20
MW-403 7/7/2000	ND	102	--	--	--	--	1,700	--	4,240
MW-403 2/29/2000	2	2	--	--	--	--	3,230	--	30
MW-403 12/13/1999	5	6	--	--	--	--	3,420	--	10
MW-403 5/3/1999	8	10	--	--	--	--	2,670	--	ND
MW-403 2/9/1999	ND	ND	--	--	--	--	3,870	--	ND
MW-403 8/6/1998	3	3	--	--	--	--	2,780	--	3,660
MW-403 5/7/1998	8	11	--	--	--	--	2,790	--	ND
MW-403 2/5/1998	6	7	--	--	--	--	3,790	--	60
MW-403 11/4/1997	5	6	--	--	--	--	3,820	--	20
MW-403 1/9/1997	10	13	--	--	--	--	2,900	--	21
MW-403 11/20/1996	6	6	--	--	--	--	3,660	--	30
MW-403 5/6-13/96	5	10	--	--	--	--	3,850	--	60

- Notes:
- 1) ND - not detected above detection limit
 - 2) NA - not analyzed
 - 3) ID - insufficient data to develop criterion
 - 4) MDNRE cleanup criteria listed in RRD Operational Memorandum #1, dated January 23, 2006.
 - 5) Analytical results & criteria listed in ug/L (ppb)
 - 6) Bold values indicate a concentration above criteria or a criteria with a concentration that exceeds it.
 - 7) A - Criterion is the State of Michigan Drinking Water Standard established pursuant to Section 5 of 1976 PA 399, MCL 325.1005
 - 8) E - Criterion is the aesthetic drinking water value, as required by Section 20120a(5) of the Natural Resources and Environmental protection Act, 1994 PA 451, as amended.
 - 9) S - Criterion defaults to the hazardous substance-specific water solubility limit.
 - 10) ND - denotes compound not detected
 - 11) "--" indicates compound was either not detected or not analyzed

Table 1
Motors Liquidation Company
Burton Parcel
Historical Groundwater Analytical Exceedances- collected from Soil Borings

Sample Location	Sample Date	MDNRE Criteria							
		Benzene	Ethylbenzene	Xylenes (Total)	Methylene Chloride	1,2,4-Trimethylbenzene	Total Arsenic	Total Lead	Total Zinc
Residential & Commercial I Drinking Water		5 (A)	74 (E)	280 (E)	5 (A)	63 (E)	10 (A)	4 (L)	2,400
Industrial & Commercial, II, III & IV Drinking Water		5 (A)	74 (E)	280 (E)	5 (A)	63 (E)	10 (A)	4 (L)	5,000 (E)
Residential Groundwater Contact Criteria		11,000	110,000	190,000	220,000	56,000 (S)	4,300	ID	1.E+08
OBG SB-12	8/22/1997	ND	ND	ND	ND	ND	29	26	150
OBG SB-14	8/22/1997	ND	ND	ND	ND	ND	63	26	80
OBG SB-16	8/25/1997	ND	ND	ND	ND	ND	56	20	150
OBG SB-28	12/13/1999	1,400	1,300	6,300	NT	NT	<1.0	10	<10

- Notes:
- 1) ND - not detected above detection limit
 - 2) NT - not tested
 - 3) ID - insufficient data to develop criterion
 - 4) MDNRE cleanup criteria listed in RRD Operational Memorandum #1, dated January 23, 2006.
 - 5) Analytical results & criteria listed in ug/L (ppb)
 - 6) Bold values indicate a concentration above criteria or a criteria with a concentration that exceeds it.
 - 7) A - Criterion is the State of Michigan Drinking Water Standard established pursuant to Section 5 of 1976 PA 399, MCL 325.1005
 - 8) E - Criterion is the aesthetic drinking water value, as required by Section 20120a(5) of the Natural Resources and Environmental protection Act, 1994 PA 451, as amended.
 - 9) S - Criterion defaults to the hazardous substance-specific water solubility limit.

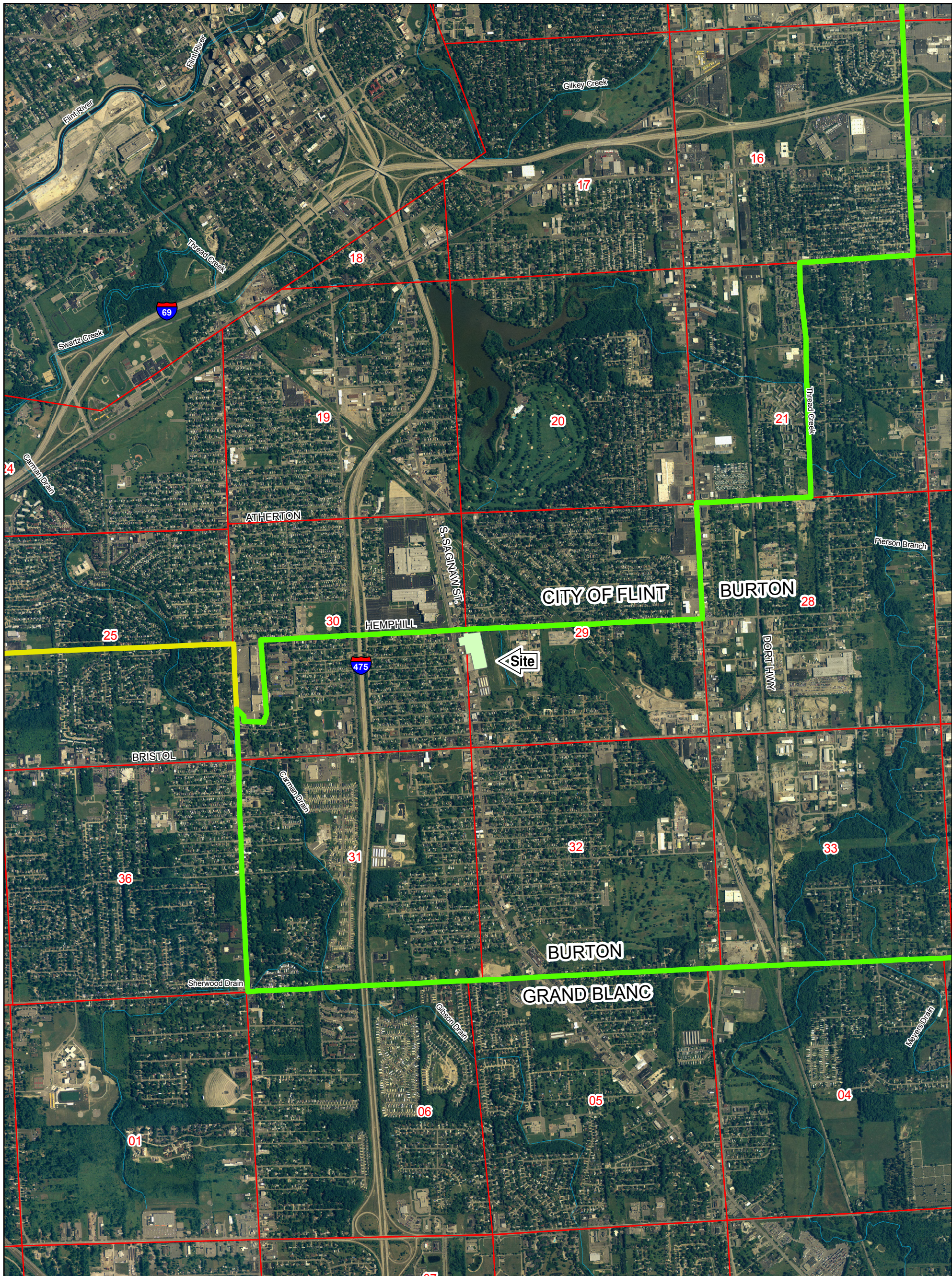
Table 2

**Motors Liquidation Company
Burton Parcel
Burton, Michigan
Waste Fill Depth**

Soil Boring Location	Depth Waste Fill Encountered (fbg)	Approximate Thickness of Waste Fill (ft)	Terminal Depth of Boring (FBG)
OBG SB-1	1-2, 6-14	8-9	20
OBG SB-2	7-20	13	22
OBG SB-3	9.5-19.5	10	22
OBG SB-4	0.5-12	11.5	16
OBG SB-7	2-5	3	16
OBG SB-8	0.5-11	10.5	14
OBG SB-9	0.5-6	5.5	14
OBG SB-13	0.5-4	3.5	14
OBG SB-14	0.5-6	5.5	14
OBG SB-22	0.5-3	2.5	14
OBG SB-23	3.5-8	4.5	16
OBG SB-24	0.5-2	1.5	14
OBG SB-1D	19.5-21	1.5	53
OBG SB-2D	4.5-6	1.5	26
OBG SB-39	3-5	2	16
OBG SB-40	2-3	1	16

Note: Soil borings installed in August 1997 and December 1999.

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PLOT DATE: 6-21-2010 AJF

LEGEND

 BURTON PARCEL

 SECTION LINE & NUMBER

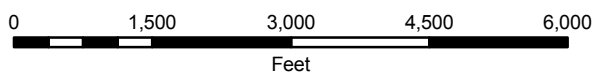
MOTORS LIQUIDATION COMPANY
BURTON PARCEL
BURTON, MICHIGAN

SITE LOCATION MAP



JUNE 2010

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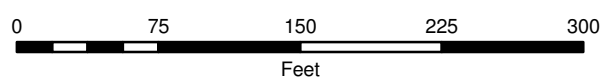
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LEGEND

- BURTON PARCEL
- FORMER BUILDINGS

MOTORS LIQUIDATION COMPANY
BURTON PARCEL
BURTON, MICHIGAN

SITE LAYOUT



JUNE 2010

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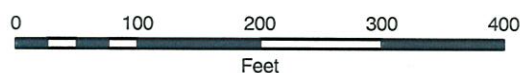


KEY

- BURTON PARCEL
- WWES GEOPHYSICAL ANOMALY
- MONITORING WELL (ACTIVE)
- MONITORING WELL (ABANDONED)
- SOIL BORING
- VADOSE ZONE MONITORING
- MDNR SURFACE SOIL
- MDNR SEDIMENT
- MDNR SURFACE WATER

MOTORS LIQUIDATION COMPANY
BURTON PARCEL
BURTON, MICHIGAN

**SITE PLAN WITH PREVIOUS
SAMPLE LOCATIONS**



JUNE 2010

14774/46306/REP/GWI WP/001/MXD/003

NOTE: FILL MATERIAL IS PRIMARILY A SILTY SAND AND GRAVEL MATRIX. WASTE MATERIALS ARE RANDOMLY INTERMIXED WITH THE PRIMARY MATRIX.

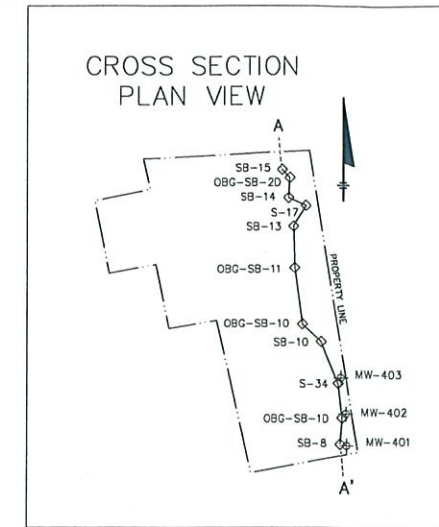
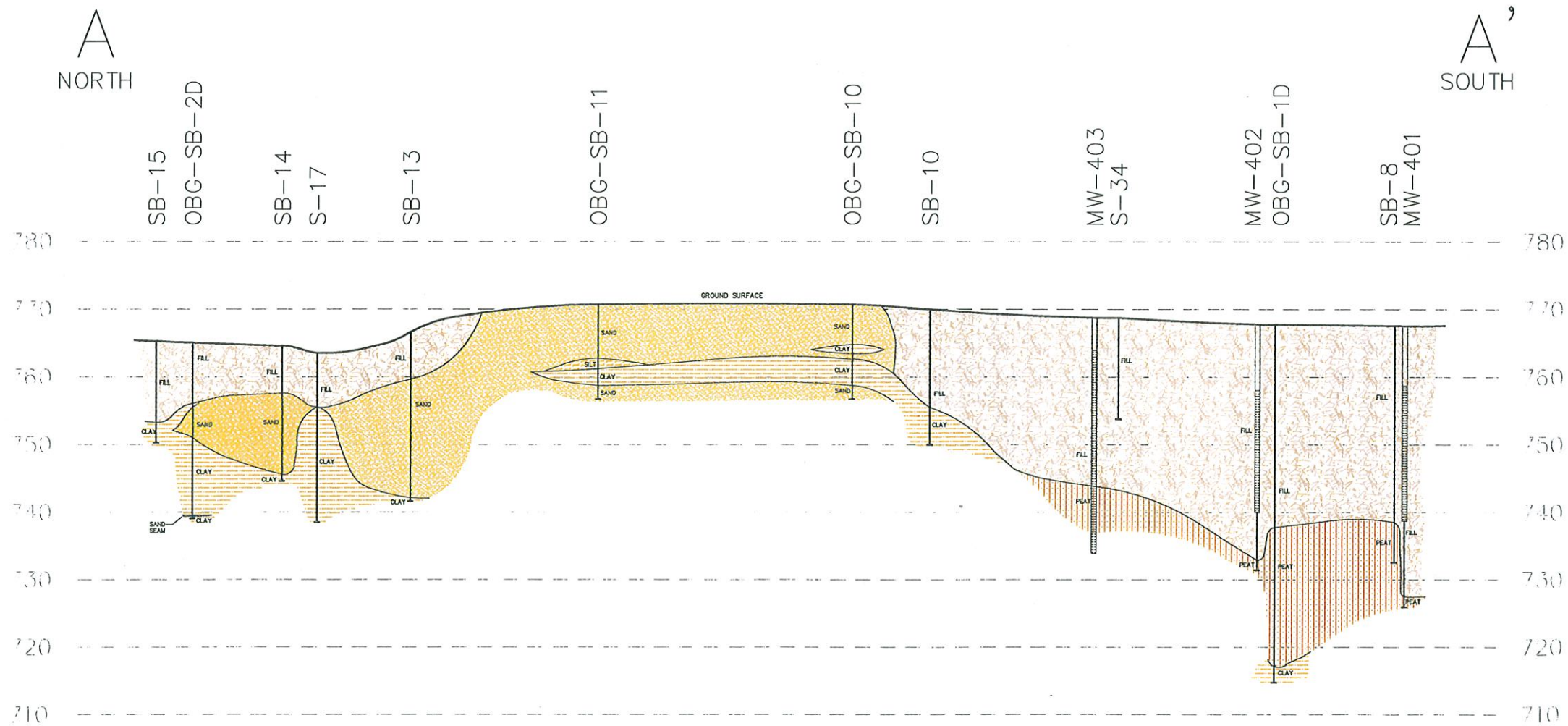


FIGURE 4

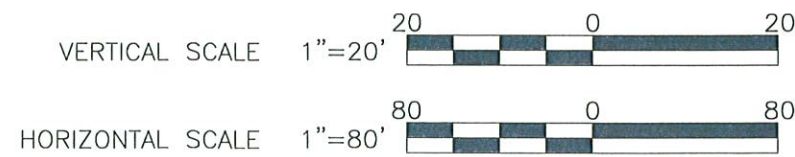
LEGEND

- SOIL BORING
- MONITORING WELL
- FILL
- SAND
- SILT
- CLAY
- PEAT



MOTORS LIQUIDATION COMPANY
BURTON PARCEL
BURTON, MICHIGAN

GEOLOGIC
CROSS SECTION



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JUNE 2010

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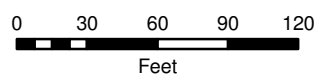
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KEY

- BURTON PARCEL
- EXISTING MONITORING WELL
- PROPOSED SHALLOW MONITORING WELL
- PROPOSED DEEP MONITORING WELL

MOTORS LIQUIDATION COMPANY
BURTON PARCEL
BURTON, MICHIGAN

**PROPOSED MONITORING
WELL LOCATIONS**



JUNE 2010

14774/46306/REP/GWI WP/001/MXD/005

APPENDIX A

Site Health & Safety Plan

**Health & Safety Plan
MLC Site #1291 –Burton Parcel
Burton, Michigan**

**Motors Liquidation Company
Detroit, Michigan**

September 2010



Health & Safety Plan
MLC Site #1291 - Burton Parcel

3289 South Saginaw Street
Burton, Michigan

Prepared for: Motors Liquidation Company
Detroit, Michigan



SCOTT L. CORMIER, P.E.
VICE PRESIDENT
O'Brien & Gere Engineers, Inc.

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FIGURES

1. Site Location
2. Site Layout
3. Hospital Route

APPENDICES

- A. Job Safety Analysis Form

1. INTRODUCTION

The Health and Safety Plan (HASP) presented herein describes the health and safety procedures and emergency response guidelines to be implemented by O'Brien & Gere Engineers, Inc. (O'Brien & Gere) during the Burton Parcel groundwater investigation. The Burton Parcel is a portion of the Hemphill Landfill Site. The Burton Parcel is an approximately 10 acre facility that is located on the corner of South Saginaw Street and Hemphill Road in Burton, Michigan. Figures 1 and 2 present the Site Location and Site Layout, respectively.

The scope of work to be completed during the Burton Parcel groundwater investigation includes the following work activities:

- Mobilization and demobilization of labor, materials, and equipment to and from the site
- Surveying activities
- Installation and completion of monitoring wells
- Collection of ground water samples.

During a portion of these activities, personnel may come in contact with soils and ground water that may contain concentrations of volatile organic compounds (VOCs) and heavy metals. This HASP has been developed to minimize contact by site personnel with these materials. Implementing the provisions of this HASP will minimize the potential for:

- Exposing site personnel to the compounds of concern
- Impacting public health and the environment by materials that may potentially migrate off site during work activities at the site
- Not complying with applicable governmental and non-governmental (American Conference of Governmental Industrial Hygienists [ACGIH]) regulations and guidelines. In particular, the rules of the Occupational Safety and Health Administration (OSHA) in Part 1910.120 (Title 29 Code of Federal Regulations [CFR] Part 1910.120) will be implemented for site work
- Adverse impact to site workers, the general public, or the environment by initiation of emergency response procedures.

For the purpose of this HASP, activities performed on site involving contact with materials with potentially elevated chemical presence will be considered contaminated operations requiring Personal Protective Equipment (PPE). A detailed description of the PPE required is presented in Section 6.1.

The applicability of this Project HASP extends to personnel who will be on site, including State and Federal Agency personnel, contractors, subcontractors of O'Brien & Gere, and visitors to the site.

The Burton Parcel groundwater investigation activities at the site that are performed by O'Brien & Gere personnel or its subcontractors will be conducted in accordance with the provisions of this HASP. A copy of this HASP will be maintained on site whenever activities are in progress.

This HASP may be modified for new scopes of work activities not covered in this HASP or by developing supplemental Job Safety Analyses (JSAs). An example of a JSA template that may be used is included in Appendix A. JSAs will reference the HASP and will identify hazards and appropriate hazard controls for new or a higher level of hazardous work as required by the HSO. JSAs may also modify air sampling, PPE, and other safety precautions in this HASP as necessary to safely perform new work activities.

1.1 PROJECT ORGANIZATION

The Burton Parcel groundwater investigation will be organized as follows: Motors Liquidation Company (MLC) will direct the project and O'Brien & Gere personnel and its subcontractors will implement the work.

O'Brien & Gere will provide an onsite project coordinator who will direct the Burton Parcel groundwater investigation activities and an onsite Health and Safety Officer (HSO) who will be responsible for verifying compliance with the Project HASP. This may be the same person if so qualified.

2. SITE CHARACTERIZATION AND POTENTIALLY HAZARDOUS COMPOUNDS

The approximately 10 acre facility is located on the corner of South Saginaw Street and Hemphill Road in Burton, Michigan. The Burton Parcel is a portion of a larger site known as the Hemphill Landfill.

The surrounding land is used for commercial purposes. As depicted on the Site Plan, (Figure 2) the subject property is bordered to the north by Hemphill Road. North of Hemphill Road is a residential neighborhood. Commercial properties are located east and south of the Burton Parcel. An open field is located east of the Burton Parcel. The Burton Parcel is located within Section 29 and 30 of Township 7 North, Range 7 East. A Site Location Map is included as Figure 1. A figure depicting the site layout is included as Figure 2. The Burton Parcel is presently a vacant lot covered partially by asphalt and gravel.

The former use of the Burton Parcel was as a commercial property and overflow employee parking for the nearby former Inland Fisher-Guide Plant. Previous investigations and historical records indicate a portion of the Burton Parcel was filled to bring this area up to grade. It was reported the fill may have included waste materials from the industrial processes performed at the manufacturing facility.

For purposes of screening, the substances of potential concern (SOPCs) in soil are defined as substances for which the detected concentrations exceed the Michigan Department of Natural Resources and Environment (MDNRE) Generic Industrial Drinking Water Protection criteria (GIDWP) per Rule 299.5748 Table 3. Soil: Industrial and Commercial II, III, and IV Part 201 Generic Cleanup Criteria and Screening Levels, December 2002. The SOPCs in ground water are defined as those substances, which exceed the MDNRE Generic Industrial Drinking Water criteria (GIDW) per Rule 299.5744 Table 1. *Groundwater: Residential and Industrial-Commercial Part 201 Generic Cleanup Criteria and Screening Levels*, December 2002. Although MDNRE criteria were used as the basis for identifying the nature and extent of waste related substances, it must be recognized that exceedance of this criteria does not necessarily represent a threat to human health or the environment.

The following paragraphs describe SOPCs identified in soil and ground water.

Subsurface Soil and Waste Fill

SOPCs identified in the soil and waste fill material at the Burton Parcel include benzene, ethylbenzene, xylenes, and lead. These SOPCs were detected in the following locations with the concentrations noted:

Table 2.0-1 SOPC Detections			
SOPCs	Location	Concentration	GIDWP*
Benzene	OBG SB-28	400 µg/kg	100 µg/kg
	OBG SB-29	120 µg/kg	100 µg/kg
	OBG SB-33	540 µg/kg	100 µg/kg
	HP-8-99	170 µg/kg	100 µg/kg
Ethylbenzene	OBG SB-2	1,900 µg/kg	100 µg/kg
	OBG SB-7	1,700 µg/kg	100 µg/kg
	OBG SB-23	49,000 µg/kg	100 µg/kg
Xylenes	OBG SB-23	35,000 µg/kg	100 µg/kg
Lead	OBG SB-2	1,100 mg/kg	700 mg/kg
	OBG SB-4	3,900 mg/kg	700 mg/kg
	OBG SB-7	1,100 mg/kg	700 mg/kg
	OBG SB-8	810 mg/kg	700 mg/kg

*GIDWP denotes MDNRE Generic Industrial Drinking Water Protection criteria

Source: O'Brien & Gere

Groundwater

SOPCs were identified in the groundwater sampled from the wells at the Burton Parcel through several investigations. Previously a groundwater sampling program was performed from 1994 through 2005. Under this program groundwater sampling has included analyses of VOCs and dissolved barium, dissolved lead and dissolved zinc on a quarterly basis. Since monitoring has been implemented, VOCs and dissolved metals have been detected above the MDNRE GIDW criteria. Specifically, benzene, ethylbenzene, xylenes, dissolve barium, dissolved lead and dissolved zinc have been detected above the MDNRE GIDW.

Previous site investigations have detected the presence of VOCs and heavy metals on site. The potential exposure routes are inhalation and skin contact. Monitoring and PPE have been selected to provide early warning and protection from these constituents.

3. BASIS FOR DESIGN

Regulations set forth by OSHA in Title 29, Code of Federal Regulations, Parts 1910 and 1926 (29 CFR 1910 and 1926) form the basis of this HASP. Emphasis is placed on Sections 1910.120 (Hazardous Waste Operations and Emergency Response), 1910 Subpart I (Personal Protective Equipment), and 1910 Subpart Z (Toxic and Hazardous Substances). In addition, current Threshold Limit Values (TLVs) formulated by the ACGIH have been considered in the development of the selection of PPE. Some of the specifications within this section are in addition to the OSHA regulations, and reflect the positions of the United States Environmental Protection Agency (USEPA), the National Institute for Occupational Safety and Health (NIOSH), and the United States Coast Guard (USCG) regarding safe operating procedures at hazardous waste sites.

The health and safety of the public and site personnel and the protection of the environment will take precedence over cost and schedule considerations for all project work.

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4. RESPONSIBILITIES AND ADMINISTRATION

O'Brien & Gere's on site project coordinator shall be responsible, along with the HSO, for all decisions regarding operations and work stoppage due to health and safety considerations. The HSO must have prior experience in working at hazardous waste sites.

The onsite HSO responsibilities include:

- Supervising and enforcing safety equipment usage, including the required use of extra equipment if appropriate
- Supervision and inspection of equipment cleaning
- Supervision of decontamination
- Conduct the onsite personnel safety indoctrination session
- Monitoring Exclusion Zone (EZ) and Contaminant Reduction Zone (CRZ) work areas
- Review and modify the HASP as more information becomes available or conditions warrant
- Authority to suspend work activity due to unsafe working conditions
- Coordination of emergency procedures
- Be responsible for performing air monitoring
- Verifying that all on site personnel have completed the required medical examination prior to arrival at the site, have met the OSHA training requirements, and have been fit tested for the respiratory equipment they may use
- Maintain the on site Hazard Communication Program including copies of Material Safety Data Sheets (MSDSs)
- Conduct brief daily safety meetings
- Administer the accident prevention program
- Immediately notifying O'Brien & Gere Corporate Health & Safety (H&S) and the appropriate client representative of all incidents
- Forwarding all incident / emergency reports to O'Brien & Gere Corporate H&S and the appropriate client representative within 24 hours
- Verifying that site personnel have received instruction regarding operating procedures, hazards, and safeguards of tools and equipment necessary to perform their job.

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5. WORKER TRAINING AND EDUCATION

Prior to commencing site activities, a Health and Safety/Site Indoctrination Session will be presented. Attendance is mandatory for personnel who will be or who are expected to be involved with project activities.

The training program will stress the importance that each attendee understands the basic principles of personnel protection and safety, be able to perform their assigned job tasks in a safe and environmentally responsible manner, and be prepared to respond in an appropriate manner to any emergency which may arise. A brief history of the site will be included and the various components of the project HASP will be presented followed by an opportunity to ask questions to ensure that each attendee understands the HASP. This training will include potential hazards, personal hygiene principles, and other appropriate SOPs. Safety equipment usage, emergency procedures, and location of first aid kits and identification of personnel trained in first aid and cardiopulmonary resuscitation (CPR) will also be discussed.

Personnel not successfully completing this training program will not be permitted to enter or work in potentially contaminated areas of the site.

Training will be given in addition to the basic training required under OSHA and is not intended to meet the requirements of 29 CFR 1910.120. Prior to entering an exclusion zone, personnel will be required to provide documentation to the HSO indicating successful completion of the training requirements of 29 CFR 1910.120.

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6. PERSONAL PROTECTIVE EQUIPMENT (PPE)

This section of the HASP describes the requirements for PPE and the specific levels of protection required for each work task to be conducted at the site during project activities. Basic PPE in all site areas will consist of Level D.

6.1 PROTECTION LEVELS

Personnel will wear protective equipment when project activities involve potential exposure to chemicals from vapors, gases, or particulates that may be generated on site or when direct contact with potentially hazardous substances may occur. Chemical resistant clothing protects the skin from contact with skin-destructive and absorbable chemicals. Respirators protect lungs, the gastrointestinal tract, and if a full-face respirator is worn, the eyes, against airborne toxicants. Respiratory protection levels will be based on the real-time air monitoring results and the action levels that are presented in Section 6.5.

Protection levels are selected based upon the following:

- Measured concentrations of the site chemicals and expected concentrations in the ambient atmosphere compared to allowable exposure levels
- Potential for exposure to chemicals in air, splashes of liquids, or other contact due to the nature of work tasks
- Site chemical toxicity, route of exposure, and chemical matrix.

All project activities conducted at the site will require the use of one of the following levels of PPE.

Level C

- 1) Tyvek® coveralls (polycoated tyvek® when handling or working with liquids [*e.g.*, decontamination])
- 2) Steel toe, leather work boots and rubber overboots (taped to suit)
- 3) Disposable inner nitrile gloves
- 4) Outer nitrile gloves (taped to the suit)
- 5) Full-face air purifying respirator (APR), equipped with organic vapor and high efficiency dust filters
- 6) Hearing protection as necessary
- 7) Eye protection (goggles, face shield, or safety glasses) as necessary
- 8) Hard hat.

Modified Level D

- 1) Tyvek® coveralls (polycoated tyvek® when handling or working with liquids) over work clothes
- 2) Steel toe, leather work boots
- 3) Outer nitrile gloves
- 4) Eye protection (goggles, safety glasses, or face shield)
- 5) Splash shields as necessary
- 6) Hearing protection as necessary
- 7) Rubber overboots as necessary;
- 8) Hard hat.

Level D

- 1) Over work clothes for skin protection
- 2) Steel toe, leather work boots
- 3) Outer nitrile gloves
- 4) Eye protection (goggles, safety glasses, or face shield)
- 5) Splash shields as necessary
- 6) Hearing protection as necessary
- 7) Rubber overboots as necessary
- 8) Hard hat.

The specific protection levels to be employed at the site for each work task are as follows:

- Surveying activities - PPE during surveying activities will be Level D
- Installation of monitoring wells - PPE during installation of monitoring wells will be Level D. PPE may be increased to Modified Level D or Level C based on PID readings and action levels described in Section 8.0
- Collection of groundwater samples – PPE during sample collection activities will be Level D.

PPE will be maintained in a clean sanitary condition and ready for use. Disposable coveralls shall be discarded when torn and as an employee leaves the EZ. Respirators shall be cleaned after each day's use and cartridges discarded. A sufficient quantity of potable water shall be supplied for washing, cleaning PPE, and drinking. A potable water supply for washing and cleaning PPE will be maintained adjacent to the decontamination area described in Section 9.0. Fresh potable water for drinking will be supplied on a daily basis and be maintained at a location removed from the active work area.

6.2 REASSESSMENT OF PROTECTION LEVELS

Protection levels provided by PPE selection shall be upgraded or downgraded based upon a change in site conditions or the review of the results of air monitoring.

When a significant change occurs, the hazards shall be reassessed. Some indicators of the need for reassessment are:

- 1) Commencement of a new work phase
- 2) Change in job tasks during a work phase
- 3) Change of season/weather
- 4) When temperature extremes or individual medical considerations limit the effectiveness of PPE
- 5) Chemicals other than those expected to be encountered are identified
- 6) Change in ambient levels of chemicals
- 7) Change in work scope which affects the degree of contact with areas of potentially elevated chemical presence.

All proposed changes to protection levels and PPE requirements will be reviewed and approved by the HSO prior to their implementation.

6.3 DURATION OF WORK TASKS

The duration of project activities involving the usage of PPE will be established by the HSO or his designee based upon ambient temperature and weather conditions, the capacity of personnel to work in the designated level of PPE (heat stress and cold stress, see Section 12.3 - Environmental Control), and limitations of the protective equipment (*i.e.*, ensemble permeation rates, life expectancy of air-purifying respirator cartridges, *etc.*). As a minimum, rest breaks will be observed at the following intervals:

- 1) 15 minutes midway between shift startup and lunch
- 2) ½ hour for lunch
- 3) 15 minutes in the afternoon, between lunch and shift end.

6.4 LIMITATIONS OF PROTECTIVE CLOTHING

PPE ensembles designated for use during project activities have been selected to provide protection against chemicals at known or anticipated concentrations in the soil and ground water. However, no protective garment, glove, or boot is chemical-proof, nor will it afford protection against all chemical types. Permeation of a given chemical through PPE is a complex process governed by the chemical concentrations, environmental conditions, physical condition of the protection garment, and the resistance of a garment to a specific chemical. Chemical permeation may continue even after the source of the chemical has been removed from the garment.

In order to obtain optimum usage from PPE, the following procedures are to be followed by all site personnel using PPE:

- 1) When using disposable coveralls, don a clean, new garment after each rest break or at the beginning of each shift;
- 2) Inspect all clothing, gloves, and boots both prior to and during use for:
 - » Imperfect seams
 - » Non-uniform coatings
 - » Tears
 - » Poorly functioning closures.
- 3) Inspect reusable garments, boots, and gloves both prior to and during use for:
 - » Visible signs of chemical permeation
 - » Swelling
 - » Discoloration
 - » Stiffness
 - » Brittleness
 - » Cracks
 - » Any sign of puncture
 - » Any sign of abrasion.

Reusable gloves, boots, or coveralls exhibiting any of the characteristics listed above will be discarded. PPE used in areas known or suspected to exhibit elevated concentrations of chemicals will not be reused.

Additional PPE usage guidelines are as follows:

- 1) Ankles/wrist openings for Tyvek coveralls will be secured tightly with the use of duct tape;

- 2) Prescription eyewear used on site shall be safety glasses equipped with side shields when full-face respirators are not required. Contact lenses shall not be used;
- 3) All EZ workers will have received training in the usage of full-face air purifying respirators and SCBA which may be required in an emergency;
- 4) Steel toe leather footwear shall be covered with neoprene overboots prior to entering the EZ and immediately upon entering the CRZ; and
- 5) Safety footwear and hard hats are to be worn by site personnel at all times.

EZ personnel also carry certain responsibilities for their own health and safety, and are required to observe the following safe work practices:

- 1) Familiarize themselves with this HASP
- 2) Use the "buddy system" when working in a contaminated operation
- 3) Use the safety equipment in accordance with training received, labeling instructions, and common sense
- 4) Maintain safety equipment in good condition and proper working order
- 5) Refrain from activities that would create additional hazards (*e.g.*, smoking, eating, *etc.* in restricted areas; leaning against dirty, contaminated surfaces)
- 6) Smoking, eating, and drinking will be prohibited except in designated areas. These designated areas may change during the duration of the project to maintain adequate separation from the active work area(s). Designation of these areas will be the responsibility of the HSO
- 7) Soiled disposable outerwear shall be removed and placed into a covered container prior to washing hands and face, eating, using lavatory facilities, or leaving the site.

6.5 RESPIRATORY PROTECTION PROGRAM

Prior to arriving at the site, all on site personnel will have received training in the use of, and have been fit tested for the air-purifying respirator that they may need to wear. All on site personnel will be required to comply with their employer specific written respiratory protection program developed in accordance with OSHA 29 CFR 1910.134.

Respiratory protection may be required during some of the project activities. This is to provide worker protection from potentially contaminated particulates and VOCs. A photoionization detector (PID) will be used to evaluate if organic vapors are present. A background reading will be established prior to commencing work activities at each active work area.

Action levels for organic vapors to evaluate the appropriate level of respiratory protection during Burton Parcel groundwater investigation activities are based on the concentration of the site chemicals measured within the breathing zone. The action levels and appropriate respiratory protection for these site activities are as follows:

Table 6.5-1 Respiratory Protection Action Levels

Sustained Organic Vapor Reading Above Background Within Worker Breathing Zone in Parts Per Million (ppm)	Action Taken
0 or Background to 5	Half -or Full-Face Respirator Available
5 - 10	Wear Half- or Full-Face Respirator
10 - 50	Wear Full-Face Respirator
>50	Stop work, remove personnel at least 10 feet from sample location

Source: O'Brien & Gere

If the ambient concentrations of organic vapors are due to identifiable substances, the level of respiratory protection may be altered by the HSO.

The appropriate air purifying respirator cartridge to be used at the site is a combination organic vapor and P-100 particulate cartridge. The cartridge used must be of the same manufacturer as the respiratory face piece.

6.6 SITE CONTROL

Designated work areas will be set up as appropriate inside the fence during the site field activities, as required. A temporary fence may be installed to prevent unauthorized access to the project work areas. The purpose of these procedures is to limit access to areas with potentially elevated chemical presence, and prevent the migration of potentially hazardous materials into adjacent clean areas. These areas are described in the following:

- 1) **The Exclusion Zone (EZ)** will be the area immediately surrounding the active work area. Sufficient area will be provided for efficient movement of personnel and equipment as well as chemical control. Boundaries are modifiable depending on operational requirements. The HSO will be responsible for maintaining the boundaries of this area. Personnel entering this area are required to wear the PPE as defined previously.

Personnel (including visitors) entering the EZ or CRZ using respiratory protection must have successfully passed a respirator fit test in accordance with OSHA 29 CFR 1910.134. Documentation of fit testing is the responsibility of each employer.

In the event that unauthorized personnel enter the EZ, work will stop. Work will not resume until the unauthorized personnel have been removed from the EZ or have been moved to an acceptable on site area. A log of all visitors to the site, including those entering the EZ, will be maintained.

- 2) **The Contaminant Reduction Zone (CRZ)** will provide a location for removal of PPE which has contacted material with elevated chemical presence and final removal and decontamination of personnel and equipment. Supplemental safety equipment, such as fire extinguishers, portable eyewash, and extra quantities of PPE may be stored in this area. The order in which safety equipment is to be donned is as follows:

- » Tyvek® suit
- » Rubber boots
- » Gloves
- » Respirator (if required)
- » Hard hat.

The following order applies when removing safety equipment:

- » Wash off boots and outer gloves prior to removal
- » Tyvek® suit
- » Hard hat
- » Respirator
- » Inner gloves.

- 3) **The Support Zone (SZ)** is situated in clean areas where there is a minimal risk of encountering hazardous materials or conditions. PPE beyond standard construction safety equipment is therefore not required.

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7. ACTIVITY HAZARD/RISK ANALYSIS

This section identifies the general hazards associated with specific project activities and presents the documented or potential health and safety hazards that exist at the site. Every effort will be made to reduce or eliminate these hazards. Those that cannot be eliminated must be guarded against by use of engineering controls and/or PPE.

The Burton Parcel groundwater investigation tasks include surveying activities, installation of monitoring wells, and collection of groundwater samples. Discussion of task-specific hazards is presented below for each planned field activity. This includes discussion of hazards related to contaminants, as well as safety or physical hazards related to the subject area, or operations or equipment inherent in the task, and the appropriate protective measures.

Monitoring well installation. The potential exists for contact with contaminated soil and the inhalation of VOCs or respirable dust/particulates containing heavy metals. These may be in the air as a result of intrusive activity. Additionally, fill material encountered during boring advancement could include glass, metal objects, rebar and result in a physical hazard.

Underground utilities will be cleared and marked prior to beginning this task. Overhead utilities will be located prior to installation of soil borings and monitoring wells. Other hazards generally associated with drilling operations include noise levels exceeding the OSHA criterion of 90 dBA, carbon monoxide released in the exhaust from the rig engines, moving parts on the drill rig that may catch clothing, and free or falling parts from the cat head that may cause injury. Personnel must wear hearing protection and hard hats when working near the operating drill rig.

Groundwater sampling. The potential exists for contact with contaminated ground water and for release of VOCs into the atmosphere at levels that may present an inhalation hazard. During ground water sampling activities, a PID will be used to evaluate the concentration of VOCs in the breathing zone.

Surveying. The surveying task will be non-invasive and presents minimal work site hazards. Surveying personnel will use caution not to slip on wet surfaces, trip over protruding objects, or fall on steep slopes or stairs. Survey personnel will minimize contact with surfaces that could be potentially contaminated.

7.1 CHEMICAL EXPOSURE

Preventing exposure to toxic chemicals is a primary concern. Chemical substances can enter the unprotected body by inhalation, skin absorption, ingestion, or through a puncture wound (injection). A contaminant can cause damage at the point of contact or can act systematically, causing a toxic effect at a part of the body distant from the point of initial contact.

Chemical exposures are generally divided into two categories: acute and chronic. Symptoms resulting from acute exposures usually occur during or shortly after exposure to a sufficiently high concentration of a chemical. The concentration required to produce such effects varies widely from chemical to chemical. The term "chronic exposure" generally refers to exposures to "low" concentrations of a contaminant over a long period of time. The "low" concentrations required to produce symptoms of chronic exposure depend upon the chemical, the duration of each exposure, and the number of exposures. For a given chemical, the symptoms of an acute exposure may be completely different from those resulting from chronic exposure.

For either chronic or acute exposure, the toxic effect may be temporary and reversible, or may be permanent (disability or death). Some chemicals may cause obvious symptoms such as burning, coughing, nausea, tearing eyes, or rashes. Other chemicals may cause health damage without any such warning signs (this is a particular concern for chronic exposures to low concentrations). Health effects such as cancer or respiratory disease may not become manifest for several years or decades after exposure. In addition, some toxic chemicals may be colorless and/or odorless, may dull the sense of smell, or may not produce any immediate or obvious physiological sensations. Thus, a worker's senses or feelings cannot be relied upon in all cases to warn of potential toxic exposure.

The effects of exposure not only depend on the chemical, its concentration, route of entry, and duration of exposure, but may also be influenced by personal factors such as the individual's smoking habits, alcohol consumption, medication use, nutrition, age, and sex.

An important exposure route of concern at the site is inhalation. The lungs are extremely vulnerable to chemical agents. Even substances that do not directly affect the lungs may pass through lung tissue into the bloodstream, where they are transported to other vulnerable areas of the body. Some toxic chemicals present in the atmosphere may not be detected by human senses (*i.e.*, they may be colorless, odorless, and their toxic effects may not produce any immediate symptoms). Respiratory protection is therefore extremely important if there is a possibility that the work site atmosphere may contain such hazardous substances. Chemicals also can enter the respiratory tract through punctured eardrums. Where this is a hazard, individuals with punctured eardrums should be medically evaluated specifically to determine if such a condition would place them at an unacceptable risk and preclude their working at the task in question.

Direct contact of the skin and eyes by hazardous substances is another important route of exposure. Some chemicals directly injure the skin. Some pass through the skin into the bloodstream where they are transported to vulnerable organs. Skin absorption is enhanced by abrasions, cuts, heat, and moisture. The eye is particularly vulnerable because airborne chemicals can dissolve in its moist surface and be carried to the rest of the body through the bloodstream (capillaries are very close to the surface of the eye). Wearing protective equipment, not using contact lenses in chemical atmospheres (since they may trap chemicals against the eye surface), keeping hands away from the face, and minimizing contact with liquid and solid chemicals can help protect against skin and eye contact.

Although ingestion should be the least significant route of exposure at the site, it is important to be aware of how this type of exposure can occur. Deliberate ingestion of chemicals is unlikely, however, personal habits such as chewing gum or tobacco, drinking, eating, smoking cigarettes, and applying cosmetics at the site may provide a route of entry for chemicals.

The last primary route of chemical exposure is injection, whereby chemicals are introduced into the body through puncture wounds (*i.e.*, by stepping or tripping and falling onto contaminated sharp objects). Wearing safety shoes, avoiding physical hazards, and taking common sense precautions are important protective measures against injection.

8. AIR MONITORING

Field activities associated with the Burton Parcel groundwater investigation may encounter conditions associated with the volatilization of chemical substances. These substances may be in the form of vapors or dusts that can enter the body through ingestion, inhalation, adsorption and direct contact. The potential chemical exposures are to VOCs. Concentrations of VOCs and dusts are expected to be below the OSHA PELs. Monitoring of these substances will be performed to evaluate whether appropriate personal protective measures are being employed during the performance of site activities.

Monitoring of soil with a photoionization detector (PID) for volatile hydrocarbon content is being performed as part of the sample screening. These measurements will be used as an indication of the need to increase worker protective measures.

Readings will be recorded in the field log book by the HSO. The HSO will be responsible for the maintenance of health and safety monitoring instruments throughout the investigation. The following describes the monitoring parameters to be evaluated during the investigation. Recommended instruments to be used are also provided in the discussion. These instruments will meet the established requirements set forth by OSHA, MSHA, NIOSH, and state agencies where applicable.

Organic Vapor Concentrations. Volatile organic compounds will be monitored at 15-minute intervals using an air-sampling instrument with a PID detector, calibrated according to the manufacturer's instructions. The concentrations of organic vapors will be used as criteria for upgrading or downgrading PPE and in implementing additional precautions or procedures.

Particulate Monitoring. Particulate monitoring is not expected to be performed during site activities. Site monitoring for health purposes will consist of visual observation of airborne dust levels.

Action Levels. Action levels have been established for activity cessation, site evacuation and determination and/or change of PPE levels. Section 6 discusses PPE required for specified site activities. Changes to these specified levels are dependent on the results of air monitoring, as described below. These action levels are based on the 1971 OSHA Permissible Exposure Limits (PELs) for the specific compounds detected during previous on site monitoring.

- **Organic Vapor.** Work will cease at any time that the average of the 15 minute breathing zone reading exceeds 5.0 ppm as indicated by the PID air sampling instrument. Work may resume after workers have donned organic vapor air purifying respirators. If the PID air sampling instrument reading is above 50 ppm, workers will not return until the level is below 35 ppm.
- **Particulates.** Upon visual observation of airborne particulate matter associated with on site activities, a water spray will be applied as a control measure. If a water spray cannot be applied and a visible airborne dust is observed, Level C protection will be provided.

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9. DECONTAMINATION PROCEDURES

In general, everything that enters the EZ at the site must either be decontaminated or properly discarded upon exit from the EZ. All personnel, including any State and local officials, must enter and exit the EZ through the decontamination area. Prior to demobilization, potentially contaminated equipment will be decontaminated and inspected by the HSO before it is moved into the clean zone.

The type of decontamination solution to be used is dependent on the type of chemical hazards. The decontamination solution for this site is laboratory-grade detergent for equipment and for any reusable PPE.

9.1 EQUIPMENT DECONTAMINATION PROCEDURES

Equipment must be decontaminated within the CRZ or on the decontamination pad by a pressure washer upon exit from the EZ. Decontamination procedures should include: knocking soil/mud from machines; water rinsing using a solution of water and laboratory-grade detergent; scraping and brushing to remove remaining soils and a final water rinse. Personnel shall wear PPE when decontaminating equipment. Runoff will be collected and stored until appropriate disposal arrangements are made. Following decontamination and prior to equipment removal from the site, the HSO shall be responsible for ensuring that the equipment has been properly cleaned. This shall be included in the field log book.

9.2 PERSONNEL DECONTAMINATION PROCEDURES

Personnel decontamination will be completed in accordance with this HASP.

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10. GENERAL SAFETY AND PERSONAL HYGIENE

- 1) Eating at the site is prohibited except in specifically designated areas. Designation of eating areas will be the responsibility of the HSO. The location of these areas may change during the duration of the project to maintain adequate separation from the active work area(s)
- 2) Smoking at the site is prohibited except in specifically designated areas
- 3) Individuals getting wet to the skin with effluent from the washing operation must wash the affected area immediately. If clothes in contact with skin are wet, then these must be changed
- 4) Hands must be washed with soap and water before eating, drinking, smoking, and before using toilets
- 5) All disposable coveralls and soiled gloves will be placed in covered containers at the end of every shift or sooner, if deemed necessary by the HSO. Wastes will be stored until proper disposal arrangements have been made
- 6) Personnel working on site will not be permitted to wear facial hair that interferes with the mask-to-face seal on air-purifying respirators.

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11. MEDICAL SURVEILLANCE

In accordance with the requirements detailed in 29 CFR 1910.120, all site personnel who will come in contact with materials with potentially elevated chemical presence will have received, within 1 year prior to starting field activities, medical surveillance by a licensed physician or physician's group.

Medical records for all on site personnel will be maintained by their respective employers. The medical records will detail the tests that were taken and will include a copy of the consulting physician's statement regarding the tests and the employee's suitability for work.

The medical records will be available to the employee or his/her designated representative upon written request, as outlined in 29 CFR 1910.1020.

Each employer will provide certifications to the HSO that its personnel involved in site activities will have all necessary medical examinations and will have obtained medical certification prior to commencing work that requires respiratory protection or potential exposure to hazardous materials. Personnel not obtaining medical certification will not perform work within the CRZ and EZ.

Interim medical surveillance will be completed if an individual exhibits poor health or high stress responses due to any site activity or when accidental exposure to elevated concentrations of chemicals occur.

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12. ENVIRONMENTAL CONTROL PROGRAM

This section of the HASP outlines measures to be implemented at the site to prevent hazards associated with environmental conditions.

12.1 WEATHER MONITORING

The HSO or Site Superintendent will be responsible for checking weather forecasts for the next day and week of work to provide advance notification of any severe weather conditions. Severe weather conditions (*e.g.*, heavy rains) may cause unsafe conditions at the site and in some situations work may have to be stopped.

12.2 RAIN AND SNOW

Excessive amounts of precipitation may cause potential safety hazards for work tasks. The hazards would be most commonly associated with slipping, tripping, or falling due to slippery surfaces.

Severe weather conditions will result in work stoppage and the implementation of further emergency measures.

12.3 TEMPERATURE

Low or high temperatures may be experienced that require measures to be implemented to prevent health and safety hazards from occurring. Potential hazards arising from temperature extremes are heat stress and cold exposure.

The potential hazard due to worker heat stress is particularly important if high protection levels of PPE are in use (*e.g.*, respirators). It is the responsibility of the HSO to determine which measures are appropriate to implement to prevent heat stress; these will depend largely on daily site conditions.

Exposure to cold is similar to heat stress in that the HSO must determine the appropriate preventative measures to implement. Some of the measures which may be implemented include: more frequent breaks, additional clothing, and partial enclosure of work areas.

12.4 WIND

High winds may be encountered at the site and these can cause hazards that may affect site personnel health and safety. Preventative measures that will be implemented if necessary are as follows:

- 1) Restricted site activity
- 2) Battening down light equipment
- 3) Partially enclosing work areas
- 4) Reduction or stoppage of work activities.

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13. EMERGENCY RESPONSE

It is essential that site personnel be prepared in the event of an emergency. Emergencies can take many forms; illnesses or injuries, chemical exposure, fires, explosions, spills, leaks, releases of harmful contaminants, or sudden changes in the weather. The following sections outline the general procedures for emergencies. Emergency information should be posted as appropriate.

13.1 EMERGENCY CONTACTS

Table 13.1-1 Emergency Contact Numbers	
Fire	911
Police	911
Ambulance	911
Hurley Hospital (Flint, MI)	(810) 257 - 9429
Source: O'Brien & Gere	

Directions to Hurley Hospital:

Take Saginaw Street north.

Continue on Saginaw Street to Fifth Avenue (Robert T. Longway).

Turn left (west) onto Fifth Avenue and continue to Patrick Street.

Turn right (northwest) into Hurley Hospital.

Figure 3 provides the route from the Site to the Hospital.

13.2 ADDITIONAL EMERGENCY NUMBERS

Table 13.2-1 Additional Emergency Contact Numbers	
National Spill Response Center (NRC)	(800) 424 – 8802
Poison Control Center	(800) 282 – 3171
Chemical Emergency Advice	(800) 424 - 9300
USEPA Emergency Response	(800) 424 - 8802
Michigan Emergency Response Hotline	(800) 292 – 4706
Flint Department of Public Works	(800) 766 - 7135
Underground Utilities Location Service	(800) 362 - 2764
MLC Project Manager (David Favero)	(217) 522-6714
Contractor Project Manager (Scott Cormier) office	(248) 477 – 5701 ext. 13
Contractor Project Manager (Scott Cormier) mobile	(248) 505-8540
Contractor Site Superintendent (Tony Finch) office	(248) 477 – 5701 ext. 14
Contractor Site Superintendent (Tony Finch) mobile	(248) 770 - 9044
Contractor On Site HSO (Mike Robison) office	(248) 477 – 5701 ext. 15
Contractor On Site HSO (Mike Robison) mobile	(734) 945-0122
Contractor Manager of Health & Safety (Jeff Parsons) office	(315) 437-6100 ext. 2871
Contractor Manager of Health & Safety (Jeff Parsons) mobile	(315) 391-0638
Source: O'Brien & Gere	

13.3 EMERGENCY EQUIPMENT AVAILABLE ON SITE

The following equipment for safety and emergency response will be maintained in the HSO's field vehicle:

- Fire extinguisher
- First aid kit
- Eye wash station (wash bottles at a minimum)
- An extra copy of this HASP.

13.4 PROJECT PERSONNEL RESPONSIBILITIES DURING EMERGENCIES

Health and Safety Officer (HSO)

As the administrator of the HASP, the HSO has primary responsibility for responding to and correcting emergency situations. The HSO will:

- Take appropriate measures to protect personnel including: withdrawal from the EZ, total evacuation and securing of the site or upgrading or downgrading the level of protective clothing and respiratory protection
- Take appropriate measures to protect the public and the environment including isolating and securing the site, preventing runoff to surface waters and ending or controlling the emergency to the extent possible
- See that appropriate Federal, State, and local agencies are informed, and emergency response plans are coordinated. In the event of fire or explosion, the local fire department should be summoned immediately. In the event of an air release of toxic materials, the local authorities should be informed in order to assess the need for evacuation. In the event of a spill, sanitary districts and drinking water systems may need to be alerted
- See that appropriate decontamination treatment or testing for exposed or injured personnel is obtained
- Evaluate the cause of the incident and make recommendations to prevent the recurrence
- See that required reports have been prepared.

13.5 MEDICAL EMERGENCIES

Any person who becomes ill or injured in the EZ will be decontaminated to the maximum extent possible. If the injury or illness is minor, full decontamination should be completed and first aid administered prior to transport. If the patient's condition is serious, at least partial decontamination should be completed as much as possible without causing further harm to the patient. First aid should be administered while awaiting an ambulance or paramedics. All injuries and illnesses must immediately be reported to the HSO and Site Superintendent.

Any person transporting an injured/exposed person to a clinic or hospital for treatment should take with them directions to the hospital and a listing of the contaminants of concern to which they may have been exposed.

Any vehicle used to transport contaminated personnel will be cleaned or decontaminated as necessary.

13.6 FIRE OR EXPLOSION

In the event of a fire or explosion, the local fire department should be summoned immediately. Upon their arrival, the HSO or designated alternate will advise the fire commander of the location, nature, and identification of the hazardous materials on site.

If it is safe to do so, site personnel may:

- If hazardous, report to the Agency On-Scene Coordinator and/or Project Manager
- Use firefighting equipment available on site
- Remove or isolate flammable or other hazardous materials which may contribute to the fire.

13.7 SPILL RESPONSE PROGRAM

There is no storage of petroleum products associated with the Burton Parcel groundwater investigation, therefore, a Spill Prevention Control and Countermeasure (SPCC) Plan is not required for this project. Because no petroleum products or chemical storage will be conducted as part of O'Brien & Gere activities, a Spill Response Procedures Plan was not prepared as part of this HASP.

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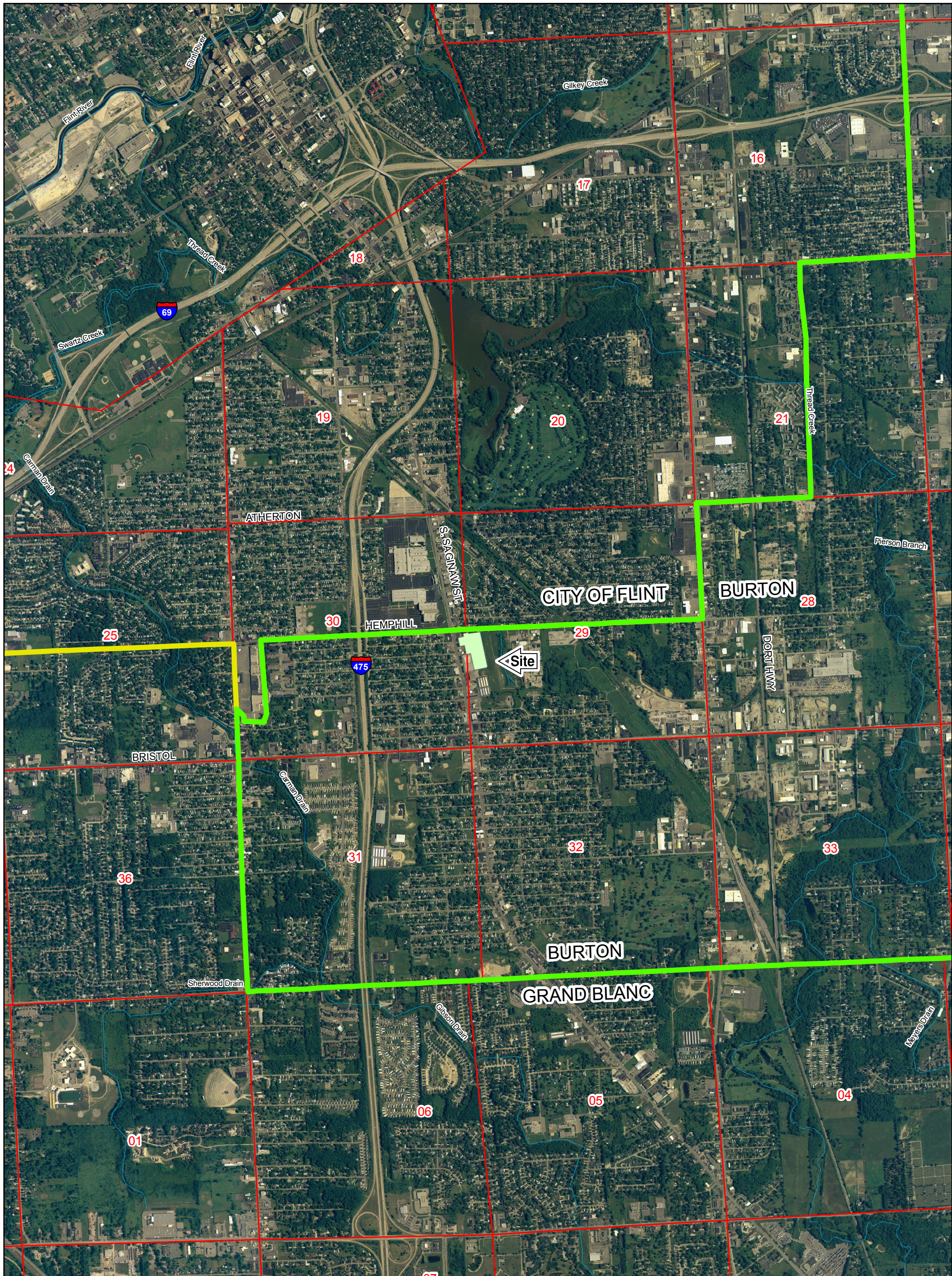
14. RECORDKEEPING

The HSO shall establish and maintain records of necessary and prudent monitoring activities as described below:

- Name and job classification of the employees involved on specific tasks
- Records of qualitative fit testing and physical examination results for site personnel
- Records of OSHA training certification for site personnel
- Records of training acknowledgment forms
- Emergency reports describing any incidents or accidents.

FIGURES

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PLOT DATE: 6-21-2010 AJF

LEGEND

 BURTON PARCEL

 SECTION LINE & NUMBER

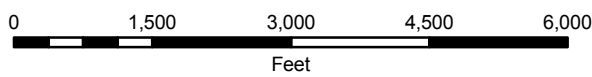
MOTORS LIQUIDATION COMPANY
BURTON PARCEL
BURTON, MICHIGAN

SITE LOCATION MAP



JUNE 2010

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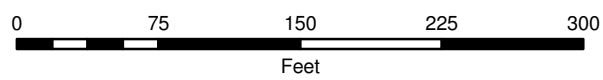
PLOT DATE: 6-21-2010 AJF

LEGEND

- BURTON PARCEL
- FORMER BUILDINGS

MOTORS LIQUIDATION COMPANY
BURTON PARCEL
BURTON, MICHIGAN

SITE LAYOUT

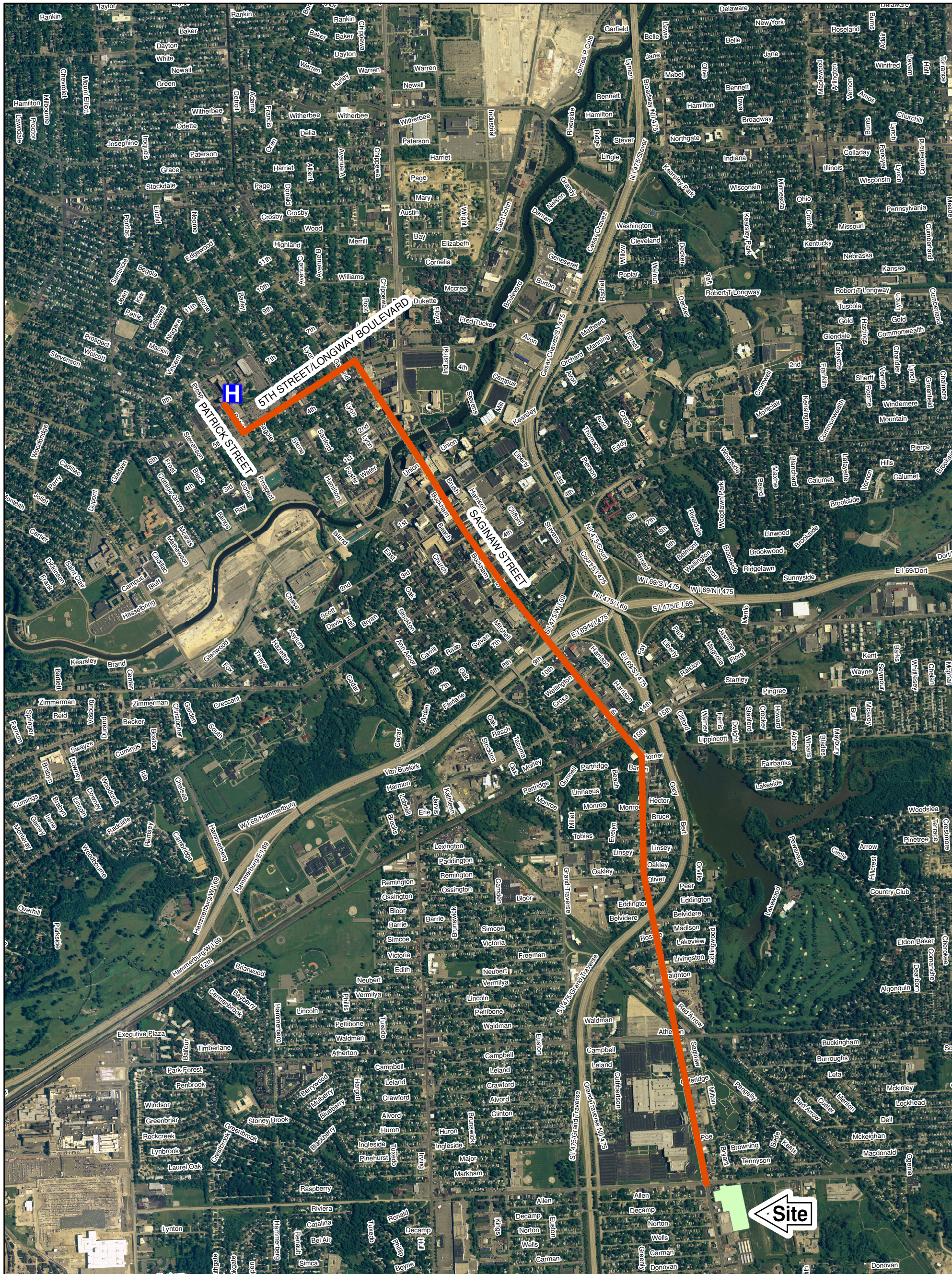


JUNE 2010

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PLOT DATE: 6-21-2010 A.J.F



LEGEND

BURTON PARCEL

HOSPITAL

MOTORS LIQUIDATION COMPANY
BURTON PARCEL
BURTON, MICHIGAN

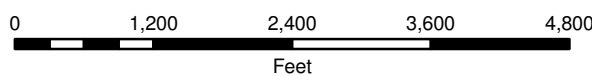
HOSPITAL ROUTE



O'BRIEN & GERE
ENGINEERS, INC.

JUNE 2010

14774/46306/REP/GWI WP/001/MXD/002



APPENDICES

This JSA template is most suitable for site surveys, sampling, test trenching, drilling/boring, water studies, wildlife studies, etc.

JSA Title:		Client Name:	
Project Name:		Client Project Manager:	
Project Number:		OBG Project Manager:	
Project Location:			
Project Phone No.:		Prepared By:	
Project Fax No.:		Revision Date:	
Scope of Work covered by this JSA (identify subcontractors covered by this JSA)			
Key Hazards (Focus on Highly Hazardous Tasks)			
Minimum Safety Equipment	<i>(additional safety equipment may be required for specific hazards identified in the following sections)</i>		
	<input type="checkbox"/> Hard Hat <input type="checkbox"/> Safety Glasses <input type="checkbox"/> Safety Shoes <input type="checkbox"/> Cut-Resistant Gloves <input type="checkbox"/> Ear Protection <input type="checkbox"/> Other (specify): <ul style="list-style-type: none"> • 		
Pre-Work Documentation & Certifications	Documentation and Certifications		To Be Submitted or Provided By.....
	<input type="checkbox"/> Drug Testing (<input type="checkbox"/> alcohol testing is also required)		
	<input type="checkbox"/> Project Safety Plan or Job Safety Analysis (JSA)		
	<input type="checkbox"/> Client/Facility Contractor Safety Orientation		
	<input type="checkbox"/> Project/O'Brien & Gere Safety Orientation		
	<input type="checkbox"/> Other (describe below): <ul style="list-style-type: none"> • Verification of Hazwoper Medical Surveillance • OSHA 40-hr Hazwoper with current 8-hr Refresher • 		

Individuals Must Sign The Last Page After Reviewing This JSA.

HAZARD	HAZARD CONTROLS (check all that apply and comment as required)	
ELEVATED WORK		
<input type="checkbox"/> NA FALLS > 6' or within 15' of a ROOF OR MEZZANINE EDGE where the fall is >6'	<input type="checkbox"/> Existing Guardrails <input type="checkbox"/> Hole Covers Marked "HOLE" <input type="checkbox"/> Fall Restraint <input type="checkbox"/> Temporary Guardrails <input type="checkbox"/> Manlifts used for elevated work <input type="checkbox"/> _____ <input type="checkbox"/> Warning Line 15' from Edge <input type="checkbox"/> Fall Arrest w/ harness/lanyard (identify tie-off points) Fall Protection Comments (describe equipment used):	
<input type="checkbox"/> NA LADDERS / STAIRS <input type="checkbox"/> Extension Ladders <input type="checkbox"/> Step Ladders <input type="checkbox"/> Fixed Ladders <input type="checkbox"/> Stairs	<input type="checkbox"/> Employees training in safe ladder use at toolbox safety meeting <input type="checkbox"/> Extension ladders are properly footed, secured at top, and setup at proper angle <input type="checkbox"/> Stepladders are set on level ground or properly shimmed with spreaders locked. <input type="checkbox"/> Stairs have proper rise over run and stairs >4 steps or 4' have guardrails. LADDERS/STAIRS COMMENTS:	
EXCAVATIONS / TRENCHING (includes test trenches)		
<input type="checkbox"/> NA <input type="checkbox"/> Max Depth ≥ 20' <input type="checkbox"/> Max Depth ≥ 5' <input type="checkbox"/> Max Depth <5' with potential cave-in hazard <input type="checkbox"/> Potential permit-required confined space at depth ≥ 4' <input type="checkbox"/> Underground utilities	<input type="checkbox"/> Excavation Competent Person Name: _____ Company _____ <input type="checkbox"/> Sloping & shoring for excavations ≥20' are approved by a professional engineer <input type="checkbox"/> Sloping & shoring for excavations ≥5' when persons are exposed to cave-in. (specify below) <input type="checkbox"/> Sloping & shoring for shallow (<5') excavations with cave-in hazard (specify below) <input type="checkbox"/> O'Brien & Gere <i>Daily Excavation Checklist</i> to be completed by the Competent Person. <input type="checkbox"/> Excavations ≥ 4' are classified as a non-permit confined space <input type="checkbox"/> Excavations ≥ 4' are classified as Alternate Entry or Permit-Required (see confined space)	

	HAZARD	HAZARD CONTROLS (check all that apply and comment as required)
	<input type="checkbox"/> Structures/foundations <input type="checkbox"/> Falls into excavations <input type="checkbox"/> Other:	<input type="checkbox"/> Underground utilities have been identified and marked. <input type="checkbox"/> Local "dig safe" organization has been notified for utility locations in public areas or rights of way. Number: _____ Date: _____ <input type="checkbox"/> Hand digging within 3' of utility locations. <input type="checkbox"/> Soft-dig/vacuum dig within ____' of utility locations. <input type="checkbox"/> Excavations are protected by perimeter fencing (not barricade tape): (<input type="checkbox"/> rigid fence - chain link or wood <input type="checkbox"/> safety fence 6' from edge.) EXCAVATION COMMENTS:
CONFINED SPACES		
<input type="checkbox"/> NA	<input type="checkbox"/> No <u>Serious</u> Hazards <input type="checkbox"/> Toxic Atmosphere <input type="checkbox"/> carbon monoxide <input type="checkbox"/> hydrogen sulfide <input type="checkbox"/> <input type="checkbox"/> Flammable Atmosphere <input type="checkbox"/> Low Oxygen <input type="checkbox"/> Combustible dust <input type="checkbox"/> Drowning - high water level or <u>potential</u> for sudden changes in flow or level <input type="checkbox"/> Other Serious Hazard:	<input type="checkbox"/> Confined space is altered so that it is no longer a confined space. (describe below) <input type="checkbox"/> Confined space is downgraded to a non-permit confined space. (identify which spaces below) <input type="checkbox"/> Alternate Entry is used. (Identify which space qualify for confined space entry below) <input type="checkbox"/> Full permit-required confined space entry is used due to presence of serious hazards. <input type="checkbox"/> Rescue team has been notified (<input type="checkbox"/> Paid FD <input type="checkbox"/> Volunteer FD <input type="checkbox"/> Plant Rescue) Rescue Team: _____ Phone Number: _____ <input type="checkbox"/> All entrants and attendants for Alternate Entry and Permit-Required Entry have confined space entry training. CONFINED SPACE COMMENTS:
OVERHEAD POWERLINES		
<input type="checkbox"/> NA	OVERHEAD POWER LINES _____ KV _____ ft above ground _____ KV _____ ft above ground	<input type="checkbox"/> Request to de-energize lines will be submitted for work within 20' of power lines. Request sent to: _____ Date: _____ <input type="checkbox"/> No one will be permitted to work <10' to power lines without lines being de-energized. <input type="checkbox"/> Project persons are informed of 20' safety zone around energized power lines. <input type="checkbox"/> Project persons are informed of additional restrictions required when working ≤20' but >10': <input type="checkbox"/> Dedicated spotter for all elevated work or operation of equipment that can contact lines <input type="checkbox"/> Barricades setup at 20' from base of power lines to establish a "restricted work area." <input type="checkbox"/> "Power Line Safety Permit" required to work within 20' of power lines. <input type="checkbox"/> Power lines are shielded and/or marked with high visibility material POWER LINE COMMENTS:
DRILLING / BORING - All self-propelled rigs including trailer-mounted drilling/boring equipment.		
<input type="checkbox"/> NA	Struck By, Run-Over, Caught In Between (pinch points), Roll Over, Hot Work (open flame) Fluid Leaks <input type="checkbox"/> Drilling/Boring Rig: specify type(s) below: _____ _____ _____	<input type="checkbox"/> Qualified persons operate all drilling/boring equipment. Qualifications were determined by: <input type="checkbox"/> Work Experience Summary on company letterhead or email with company email address. <input type="checkbox"/> Other (describe): _____ <input type="checkbox"/> Equipment will be inspected upon mobilization by: _____ NOTE - Inspections will include (but not be limited to) the following: leaks, defective safety equipment, and loose/unsecured parts that could fall during operation) <input type="checkbox"/> Operators will be reminded of seatbelt use by: _____ <input type="checkbox"/> High visibility vests are required for: _____ <input type="checkbox"/> Cut-resistant gloves are required when handling cable, rods, and other sharp or "splintery" materials <input type="checkbox"/> Chemical-resistant gloves and clothing are required while handling grout, cement, chemicals, or contaminated materials including soil or groundwater. (Refer to "Environmental Hazards" section for more information.) <input type="checkbox"/> Operators and helpers will maintain a safe distance to moving parts. All those working near moving or rotating parts will secure loose hair, clothing, and equipment. All those working near the rods/casings are instructed to not put themselves in a position where they could get hurt if the rods/casings should turn or drop. <input type="checkbox"/> Drill rods, casings, and other equipment will be stored neatly when not in use and secured to prevent them from falling on, or rolling into, site personnel. <input type="checkbox"/> The area will be cleared of rope, cords, weed-block fabric , or similar material that could become wrapped around the auger, entangle someone and then pull them into the auger. <input type="checkbox"/> Fall protection will be worn whenever (if) the drilling/boring mast must be climbed above 6'. (Tie-off Points are specified: <input type="checkbox"/> in "Comments" below <input type="checkbox"/> in the "Fall Protection" section)

	HAZARD	HAZARD CONTROLS (check all that apply and comment as required)
		<input type="checkbox"/> Masts located within 20' of an overhead power line will only be lowered or raised with a dedicated spotter. (Refer to the "Overhead Powerlines" section of this JSA for additional safety precautions) <input type="checkbox"/> Drill rigs will only be moved with masts lowered . <input type="checkbox"/> Masts will be erected with outriggers fully extended when equipped with outriggers. <input type="checkbox"/> Outriggers will be placed on a firm, stable surface or will be cribbed to prevent sinking of outriggers and collapse of the drilling/boring rig. <input type="checkbox"/> Drilling on sloped surfaces will be conducted such that the drilling/boring equipment remains stable and otherwise in accordance with requirements outlined below in Drilling/Boring comments. <input type="checkbox"/> Damage to underground utilities will be prevented by cribbing outriggers to spread the load or relocated outriggers so they are not placed on utilities. <input type="checkbox"/> Procedures for responding to natural gas emissions (explosive vapors) are: <input type="checkbox"/> Outlined in "Comments" below. <input type="checkbox"/> Outlined in an attached procedure. <input type="checkbox"/> Procedures for drilling/boring from a barge or otherwise working over water are: <input type="checkbox"/> Outlined in "Comments" below. <input type="checkbox"/> in the "Working Over Water" section. <input type="checkbox"/> Drilling/boring equipment will be de-energized and locked-out prior to maintenance. <input type="checkbox"/> Site personnel working in the area surrounding the drilling/boring rig have will be informed where the emergency shutoff in the event of an emergency. Specify the location of the shutoff in the "Comments" section below. <input type="checkbox"/> Spill equipment is available for fuel and hydraulic fluid leaks. Location: _____ DRILLING/BORING COMMENTS:
HEAVY EQUIPMENT (other than drilling/boring rigs)		
<input type="checkbox"/> NA	Struck By, Run-Over, Caught In Between (pinch points), Roll Over, Fluid Leaks <input type="checkbox"/> Excavator <input type="checkbox"/> Dump Truck <input type="checkbox"/> mini Skid Steer (bobcat) <input type="checkbox"/> mini Excavator <input type="checkbox"/> Gator/Off-Road Vehicle <input type="checkbox"/> Other: _____ <input type="checkbox"/> Other: _____ <input type="checkbox"/> Manlift - specify type(s):	<input type="checkbox"/> Qualified persons operate all heavy equipment. Qualifications were determined by: <input type="checkbox"/> Work Experience Summary on company letterhead or email w/ company email address. <input type="checkbox"/> Other (describe): _____ <input type="checkbox"/> Equipment will be inspected upon mobilization by: _____. (NOTE - All leaks or defective safety equipment <u>must</u> be repaired before use.) <input type="checkbox"/> Operators are required to wear seatbelts for all equipment provided with seatbelts. <input type="checkbox"/> High visibility vests are required for: _____ <input type="checkbox"/> Operators will review manufacturer's safety guidelines for all equipment operated on slopes including Gators® and similar ATVs/4x4's. (In the "Comments" section below, specify the maximum slope for each piece of equipment that will be operated on slopes. This may be completed upon mobilization.) <input type="checkbox"/> Dump trucks, 4x4's, or other haul vehicles will not be loaded beyond manufacturer capacities or weight limits established by state and local authorities for transportation. <input type="checkbox"/> Counterweight swing radius will be barricaded. <input type="checkbox"/> Operators and helpers will maintain a safe distance to moving parts . All those working near moving or rotating parts will secure loose hair, clothing, and equipment. <input type="checkbox"/> Fall protection will be worn by all those in manlifts (scissor lifts are excepted: <input type="checkbox"/> Yes <input type="checkbox"/> NO) <input type="checkbox"/> Spill equipment is available for fuel and hydraulic fluid leaks. Location: _____ HEAVY EQUIPMENT COMMENTS:
POWER TOOLS, HAND TOOLS & AUGERS, EXTENSION CORDS, & ELECTROFISHING (FISH SHOCKING) EQUIPMENT		
<input type="checkbox"/> NA	eye injury, hand/arm cuts, electrical shock, strains, foot injuries, dust <input type="checkbox"/> Misc Handtools (shovels, hammers, trowels, etc.) <input type="checkbox"/> Chainsaws (Clearing & Grubbing) <input type="checkbox"/> Sharp hand-tools (knives, cutters, scissors) <input type="checkbox"/> Electrofishing (Fish Shocking) Equipment <input type="checkbox"/> Hand Augers - Iwan or Spiral type <input type="checkbox"/> Hand Sampler - Split Spoon or Thin Wall	<input type="checkbox"/> All tools and electrical cords in-use will be inspected daily by: <input type="checkbox"/> Users <input type="checkbox"/> Site Supervisor/Safety Coordinator <input type="checkbox"/> Other: _____ <input type="checkbox"/> Only the right tools will be used in a manner for which they were designed. <input type="checkbox"/> GFCIs will be used on all extension cords and 120v power tools. <input type="checkbox"/> All extension cords are in good condition with no cuts through outer insulation, ground plugs are present, and no "vinyl tape" repairs. (Only <u>12 gauge</u> extension cords may be repaired.) <input type="checkbox"/> Face shield and safety glasses used (required for chain saws and chemical handling) <input type="checkbox"/> Kevlar chaps and jacket (required for all chainsaw work) <input type="checkbox"/> Cut-resistant gloves are worn whenever cutting tools are used. <input type="checkbox"/> Safety cutters or scissors are required for all cutting activities (no fixed-blade knives). <input type="checkbox"/> Hearing protection required for which tools or areas: _____ <input type="checkbox"/> All hand augers and sampling probes will be inspected and verified to be in good conditions with ALL parts required by the manufacturer. Inspections will be completed by:

HAZARD	HAZARD CONTROLS (check all that apply and comment as required)
<ul style="list-style-type: none"> <input type="checkbox"/> Hand Probe (GeoProbe) with ____ lb weight <input type="checkbox"/> Manual Cathead Hoist with ____ lb weight <input type="checkbox"/> Motorized Cathead Hoist with ____ lb weight <input type="checkbox"/> Light-weight Motorized Auger drills (not truck-mounted) <input type="checkbox"/> Manhole Lifting Devices (specify in Comments) <input type="checkbox"/> Other (specify): 	<ul style="list-style-type: none"> <input type="checkbox"/> Users <input type="checkbox"/> Site Supervisor/Safety Coordinator <input type="checkbox"/> Other: _____ <input type="checkbox"/> Persons using sampling probes equipped with manual slide hammers are physically capable of handling the weight without difficulty and keep hands clear of pinch-points. <input type="checkbox"/> Persons using manual and motorized cathead hoists have been trained on how to operate them in accordance with manufacturer guidelines. (Identify qualified persons by name in the "Comments" Section below.) <input type="checkbox"/> Electrofishing equipment will be inspected and verified to be in good conditions with ALL parts required by the manufacturer and exterior cords have no cuts through outer insulation and no "vinyl tape" repairs. Inspections will be completed by: <ul style="list-style-type: none"> <input type="checkbox"/> Users <input type="checkbox"/> Site Supervisor/Safety Coordinator <input type="checkbox"/> Other: _____ <input type="checkbox"/> Persons using Electrofishing Equipment have been trained on how to operate it in accordance with manufacturer guidelines. (Identify qualified persons by name in the "Comments" Section below.) <input type="checkbox"/> Electrofishing will be discontinued if the public approaches within 100' <input type="checkbox"/> Electrofishing boats will be marked with "Danger Electricity" signs (or equivalent) that can be read at a distance of 150'. <input type="checkbox"/> All electrofishing team members wear electrically-rated rubber gloves that are inspected daily by users and replaced every 6 months. Use leather or other cut-resistant gloves to protect the rubber gloves. (Similar to NFPA 70E requirements.) <input type="checkbox"/> All electrofishing team members wear chest or hip waders to insulate the wearer from electrical shock. <input type="checkbox"/> Net handles for nets used during electrofishing will be nonconductive and long enough to keep hands out of the water. <input type="checkbox"/> The positive electrode (anode) on portable electroshockers is equipped with a manual switch that stops the current when released and is not "bypassed" with a hold-down mechanism (i.e., tape) <input type="checkbox"/> At least two (2) persons on each Electrofishing boat or location are trained in CPR. <input type="checkbox"/> All personnel involved in electrofishing know the location of the emergency shutoff switch. <input type="checkbox"/> Backpack electrofishing equipment is equipped with a tilt switch that stops the current if the operator falls. <p>POWER TOOLS, HAND TOOLS & AUGERS, EXTENSION CORDS, & ELECTROFISHING COMMENTS:</p>

WORKING OVER/NEAR WATER OR ON ICE

<p>drowning, hypothermia (winter months), spills to surface waterways, fall through ice</p> <ul style="list-style-type: none"> <input type="checkbox"/> Barge-mounted drilling/boring rigs <input type="checkbox"/> Sampling from a boat <input type="checkbox"/> Boat required for site access <input type="checkbox"/> Work on an ice covered body of water <input type="checkbox"/> Other: <p><input type="checkbox"/> NA</p>	<ul style="list-style-type: none"> <input type="checkbox"/> 100% Fall Protection while working over water or when otherwise exposed to a drowning hazard. (Describe how fall protection will be implemented, Tie-off points, and the equipment that will be used. <input type="checkbox"/> in "Comments" below <input type="checkbox"/> in the "Fall Protection" section) <input type="checkbox"/> A "safety observer" will remain on shore with the ability to contact emergency response personnel and communicate with those on boats/barges. <input type="checkbox"/> USG-approved flotation vests will be used. <input type="checkbox"/> Ring-buoy with 90' of rope and placed within 100' of site personnel. <input type="checkbox"/> Rescue skiff will be staged such that one person can immediately launch the skiff. <input type="checkbox"/> At least one person will be available to launch and operate the rescue skiff. NOTE - "Safety Observer" may launch rescue skiff after making emergency response notification(s). <input type="checkbox"/> Ice Safety - Core samples will be taken every 100' on lakes or 50' on rivers to evaluate the thickness and quality of ice (i.e., <i>clear/blue ice</i> = best quality, <i>white/opaque ice</i> = moderate quality/use caution, <i>gray/slushy ice</i> = poor quality/unsafe). <input type="checkbox"/> Ice Safety - Conservative load estimates are established for static and/or moving loads as appropriate for the type of work being conducted. Load estimates are explained: <ul style="list-style-type: none"> <input type="checkbox"/> in "Comments" below <input type="checkbox"/> in an attached document <input type="checkbox"/> Spill Control - Floating booms will be used around barges, shore-based heavy equipment, or other locations where hydraulic fluid may leak from equipment into surface water. <input type="checkbox"/> Spill Control - Silt curtains will be suspended below floating booms. <input type="checkbox"/> Boats and Barges will not be operated above their weight capacity. <input type="checkbox"/> Boats and barges operated (or potentially operated) in bad weather will be operated below their weight capacity by ____% (suggest at least 25%). <input type="checkbox"/> Boat and barge emergency calls - Weather resistant radios that broadcast on Coast Guard frequencies (Channel 16 VHF/FM or 2182 MHz) will be available for emergency calls. <input type="checkbox"/> Boat or barge-based operations will be discontinued when NOAA issues a small craft advisory or when sustained wind speeds of 20 mph are observed and create dangerous wave or boat/barge handling conditions. <input type="checkbox"/> NOAA Weather Radio Receiver will be used to monitor weather conditions that may affect
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	HAZARD	HAZARD CONTROLS (check all that apply and comment as required)
		boat or barge-based activities. WORKING OVER WATER COMMENTS:
MANUAL MATERIAL HANDLING / MATERIAL STORAGE / HOUSEKEEPING		
<input type="checkbox"/> NA	back or shoulder strain, struck by falling objects, trips and falls, incompatible materials (fire or explosion) <input type="checkbox"/> hvy manual lifting (>50 lbs) <input type="checkbox"/> chemical storage <input type="checkbox"/> compressed gas storage <input type="checkbox"/> Tall storage greater than 2 pallets stacked. <input type="checkbox"/> Material & equipment laydown areas <input type="checkbox"/> Trash & debris removal <input type="checkbox"/> Temporary cords & hoses placed across walkways <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> Mechanical lifting equipment used to reduce manual material handling: (<input type="checkbox"/> Forklift/Lull <input type="checkbox"/> Heavy Equipment <input type="checkbox"/> Dolly <input type="checkbox"/> _____) <input type="checkbox"/> Manual lifting more than 75 lbs by a single person will be avoided. <input type="checkbox"/> Good manual lifting techniques will be reviewed with the following trades/persons prior to site work: _____ <input type="checkbox"/> "Hay Hook" style manhole removal tools will NOT be used to remove manhole covers. <input type="checkbox"/> "Hay Hook" style manhole removal tools will be used AND the justification why an alternate, lower-stress removal tool is not available is in the "Comments" section below. <input type="checkbox"/> Incompatible chemicals will be separated by 20' or a concrete block wall. <input type="checkbox"/> Secondary containment will be provided for the following chemicals: _____ <input type="checkbox"/> Safety equipment will be located near chemical storage. <input type="checkbox"/> Spill Kit <input type="checkbox"/> Emergency Shower <input type="checkbox"/> Eyewash <input type="checkbox"/> Drench Hose <input type="checkbox"/> Splash PPE <input type="checkbox"/> Flammable gases and oxygen will be separated by 20'. <input type="checkbox"/> All compressed gas cylinders will be transported vertically and secured upright. <input type="checkbox"/> Equipment and materials will be stacked in laydown areas with aisles as necessary for safe access. All un-used equipment & materials will be returned to laydown areas daily. Designated laydown areas: _____ <input type="checkbox"/> Materials will not be stacked greater than 2 pallets high without being secured. <input type="checkbox"/> Trash and debris will be removed daily and placed in designated containers. Specify debris segregation and location of disposal containers below. <input type="checkbox"/> Hoses & Cords will be run out of walkways (e.g., within 6" of walls or 7.5' overhead) <u>whenever possible</u> or will be clearly marked by cones or barricades. <input type="checkbox"/> All chemical containers will be labeled per Hazard Communication requirements. MATERIAL HANDLING & HOUSEKEEPING COMMENTS:
ROADWAY, RAILROAD, & SIDEWALK OBSTRUCTION		
<input type="checkbox"/> NA	<input type="checkbox"/> Vehicle accidents <input type="checkbox"/> Pedestrians struck by vehicles or heavy equipment <input type="checkbox"/> Pedestrians falls <input type="checkbox"/> Pedestrian struck-by falling objects <input type="checkbox"/> Railroad accidents	<input type="checkbox"/> DOT signal devices will be used to re-route vehicles around excavations or busy site entrances/exits that affect road traffic. <input type="checkbox"/> Roadway Flaggers will be used and have DOT Flagger Training <input type="checkbox"/> Pedestrian traffic will be safely routed around or over excavations. <input type="checkbox"/> Pedestrian traffic will be safely routed around or under overhead work. <input type="checkbox"/> Railroad owner notified for permission to work on the railroad right-of-way. <input type="checkbox"/> Railroad flagger is required for work in the right-of-way. <input type="checkbox"/> Equipment, materials, and personnel may not be closer than 15' to the nearest railroad rail if the railroad flagger or the flagger's signal is not visible. <input type="checkbox"/> Derailer(s)/bumper(s) will be installed on railroad tracks to isolate the work area. ROADWAY, RAILROAD, & SIDEWALK COMMENTS:
BIOLOGICAL HAZARDS		
<input type="checkbox"/> NA	Infection, Lyme Disease, West Nile Virus, Eastern Equine Encephalitis (EEE), Severe Rash, Allergic Reaction, Venom effects <input type="checkbox"/> Ticks <input type="checkbox"/> Mosquitoes (EEE, WNV, etc) <input type="checkbox"/> Venomous Snakes <input type="checkbox"/> Venomous Spiders <input type="checkbox"/> Poison Ivy, Oak, or Sumac <input type="checkbox"/> Bees & Wasps <input type="checkbox"/> Fire Ants <input type="checkbox"/> Other (identify below):	<input type="checkbox"/> Use DEET (25%-98%) repellent on skin for protection against mosquitoes, ticks, and similar insects. Use higher concentrations for heavily infested areas. <input type="checkbox"/> Use Permethrin repellent on clothing in areas heavily infested with ticks, chiggers, etc. <input type="checkbox"/> All site personnel will be instructed on how to identify poison ivy, sumac, and oak . (O'Brien & Gere Field Identification Guide or equiv. has been posted? <input type="checkbox"/> YES <input type="checkbox"/> NO) <input type="checkbox"/> Poison ivy barrier creams (e.g., Ivy Block) will be used on exposed skin prior to the workday. <input type="checkbox"/> Poison ivy neutralizing wipes or rubbing alcohol will be used on hands and exposed skin following work activities or incidents where contact with poison ivy/oak/sumac is suspected. <input type="checkbox"/> Protective coveralls (such as Tyvek) will be used to prevent contact with ticks or poison ivy. <input type="checkbox"/> All site personnel will be instructed on how to identify venomous snakes indigenous to the area. List venomous snakes of concern in the "Comments" section below. (O'Brien & Gere Field Identification Guide or equiv. has been posted? <input type="checkbox"/> YES <input type="checkbox"/> NO) <input type="checkbox"/> All field personnel with a potential to encounter venomous snakes will wear: <input type="checkbox"/> Snake Chaps AND/OR <input type="checkbox"/> High Leather Safety Boots (NOT ankle-high boots/shoes) <input type="checkbox"/> All site personnel will be instructed on how to identify venomous spiders indigenous to the

HAZARD	HAZARD CONTROLS (check all that apply and comment as required)																										
<p>Exposure to hazardous vapors or dust, contact with contaminated materials, fire, explosion.</p> <p>Contaminants of Concern and hazardous chemicals include:</p> <p><input type="checkbox"/> volatile organic compounds (describe: _____)</p> <p><input type="checkbox"/> semivolatle organic cmpds (describe: _____)</p> <p><input type="checkbox"/> metal dusts (describe: _____)</p> <p><input type="checkbox"/> PCBs</p> <p><input type="checkbox"/> Caustic (NaOH)</p> <p><input type="checkbox"/> Acid (H2SO4, HCL)</p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p>(many other hazardous waste and chemical hazards are covered elsewhere in this JSA)</p> <p><input type="checkbox"/> NA</p>	<p>area. List venomous spiders of concern in the "Comments" section below. (O'Brien & Gere Field Identification Guide or equiv. has been posted? <input type="checkbox"/> YES <input type="checkbox"/> NO)</p> <p><input type="checkbox"/> Site personnel with known allergies to bee/wasp stings, fire ant bites, or other insect bites carry an "EpiPen" or equivalent medication prescribed for treating allergic reaction.</p> <p>BIOLOGICAL HAZARDS COMMENTS:</p> <hr/> <p><input type="checkbox"/> Site workers with a potential for contact with contaminated materials and work in Level C PPE will have OSHA 40-hour training, current 8-hour refresher, and medical exam.</p> <p><input type="checkbox"/> Site workers with minimal contact with contaminated materials and no work in Level C PPE will have OSHA 40-hour OR 24-hour training, current 8-hour refresher, and medical exam.</p> <p><input type="checkbox"/> Foremen or Supervisors overseeing field crews will have 8-hour OSHA Supervisor training.</p> <p><input type="checkbox"/> No intrusive work activities or areas are anticipated with current scope of work.</p> <p><input type="checkbox"/> Intrusive work activities include: _____</p> <hr/> <p><input type="checkbox"/> The perimeter of intrusive work areas are identified by: _____</p> <p><input type="checkbox"/> Decontamination of personnel or equipment is <u>not</u> anticipated with the current scope of work.</p> <p><input type="checkbox"/> Decontamination of personnel and small tools will be conducted as follows: _____</p> <hr/> <p><input type="checkbox"/> Decontamination of heavy equipment will be conducted as follows: _____</p> <hr/> <p><input type="checkbox"/> Heavy equipment leaving the site will be inspected by: _____</p> <p><input type="checkbox"/> Work area monitoring is not anticipated with the current scope of work.</p> <p><input type="checkbox"/> Work area air monitoring will be conducted per attached air monitoring plan & action levels.</p> <p><input type="checkbox"/> Work Area Air Monitoring as follows for: <input type="checkbox"/> Dust, <input type="checkbox"/> VOCs, <input type="checkbox"/> Other: _____</p> <p>(NOTE - Insert additional or revise existing response actions as appropriate)</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">Action Levels</th> <th>Description & Response Actions</th> </tr> </thead> <tbody> <tr> <td></td> <td>1. <u>Level C PPE</u> - Tyvek, boot covers, nitrile gloves, half or full face w/ respirator with _____ cartridges changed (<input type="checkbox"/> daily, <input type="checkbox"/> _____) OR</td> </tr> <tr> <td></td> <td>2. Reduce contaminant concentrations below action level(s).</td> </tr> <tr> <td></td> <td>1. <u>Level B PPE</u> - Same as above except with a supplied air respirator OR</td> </tr> <tr> <td></td> <td>2. Reduce contaminant(s) below Level B action level(s).</td> </tr> <tr> <td></td> <td>1. STOP work</td> </tr> </tbody> </table> <hr/> <p><input type="checkbox"/> Community Air Monitoring is not anticipated with the current scope of work.</p> <p><input type="checkbox"/> Community Air Monitoring is required per the attached air monitoring plan & action levels.</p> <p><input type="checkbox"/> Community Area Air Monitoring as follows for: <input type="checkbox"/> Dust, <input type="checkbox"/> VOCs, <input type="checkbox"/> Other: _____</p> <p>(NOTE - Insert additional or revise existing response actions as appropriate)</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">Action Levels</th> <th>Description & Response Actions</th> </tr> </thead> <tbody> <tr> <td></td> <td>1. If dust or odors are observed leaving the site perimeter, then dust/odor controls must be implemented.</td> </tr> <tr> <td></td> <td>2. If dust/odor controls fail to prevent dust/odor emissions from leaving the site, then STOP work and notify the client contact.</td> </tr> <tr> <td></td> <td>1. Use dust/odor suppression techniques outlined in the "Comments" section.</td> </tr> <tr> <td></td> <td>2. Evaluate additional techniques or controls if necessary.</td> </tr> <tr> <td></td> <td>3. Notify the client contact.</td> </tr> <tr> <td></td> <td>1. STOP work</td> </tr> </tbody> </table> <p>ENVIRONMENTAL & CHEMICAL HAZARD COMMENTS:</p>	Action Levels	Description & Response Actions		1. <u>Level C PPE</u> - Tyvek, boot covers, nitrile gloves, half or full face w/ respirator with _____ cartridges changed (<input type="checkbox"/> daily, <input type="checkbox"/> _____) OR		2. Reduce contaminant concentrations below action level(s).		1. <u>Level B PPE</u> - Same as above except with a supplied air respirator OR		2. Reduce contaminant(s) below Level B action level(s).		1. 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	3. Notify the client contact.																										
	1. STOP work																										

Post Emergency Response Information On-Site or Retain Near Work Area

EMERGENCY RESPONSE			
(911 Service is Available <input type="checkbox"/> Yes <input type="checkbox"/> No Cell Phone Required <input type="checkbox"/> Yes <input type="checkbox"/> No)			
Alternate Emergency Number (if not "911"):			
Site Address:			
Muster Point in case of site evacuation:			
Emergency Medical Treatment - Hospital Name:		Number:	
Hospital Address:			
Non-Emergency Med. Treatment - Clinic Name:		Number:	
Occupational Clinic Address:			
Fire Department Name		Number:	
Spill Response:		Number:	
Client Representative Name::		Office Number:	
		Cell Number:	
O'Brien & Gere Project Manager Name:		Office Number:	
		Cell Number:	
O'Brien & Gere Corporate H&S Name:		Office Number:	
		Cell Number:	
Contact Name:		Office Number:	
		Cell Number:	
Contact Name:		Office Number:	
		Cell Number:	
EMERGENCY RESPONSE COMMENTS:			
1. Upon occurrence of any injury, fire, explosion, major spill (beyond incidental), property damage >\$1,000, or near-miss that could have resulted in a fatality or disabling injury, IMMEDIATELY NOTIFY the O'Brien & Gere Project Manager, O'Brien & Gere Manager of Corporate H&S, and the Client Representative.			
2. Complete an <i>Incident Report</i> within 24 hours and submit to the O'Brien & Gere Manager of Corporate H&S for review.			
3. First Aid and CPR supplies are located _____ Spill Supplies are located _____.			
4. Emergency numbers and Hospital Route Map are posted _____.			

<INSERT HOSPITAL ROUTE MAP>

Quality Control Document

**Quality Control Document for the Groundwater
Investigation Work Plan
MLC Site #1291 –Burton Parcel
Burton, Michigan**

**Motors Liquidation Company
Detroit, Michigan**

September 2010



**Quality Control Document for
the Groundwater Investigation
Work Plan
MLC Site #1291 - Burton Parcel**

**3289 South Saginaw Street
Burton, Michigan**

Prepared for: Motors Liquidation Company
Detroit, Michigan



SCOTT L. CORMIER, P.E.
VICE PRESIDENT
O'Brien & Gere Engineers, Inc.

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QCD DOCUMENT DISTRIBUTION

Anthony Finch – O'Brien & Gere

Karen Storne – O'Brien & Gere

Maya Murshak – Merit Laboratories, Inc.

Denise Heckler- TestAmerica, Inc. North Canton, Ohio

1. INTRODUCTION

This Quality Control Document (QCD) has been developed by O'Brien & Gere for the Motors Liquidation Company (MLC) for a groundwater investigation at the Burton Parcel (located within the Hemphill Landfill), located on the corner of South Saginaw Street and Hemphill Road in Burton, Michigan (Site). This QCD is provided as a part of the Burton Parcel Groundwater Investigation Work Plan (Work Plan) (O'Brien & Gere 2010).

This QCD presents the investigation objectives and quality assurance/quality control (QA/QC) activities associated with sampling and analysis of environmental samples at the Site. The procedures in this QCD will be followed by personnel participating in the field investigation and in the laboratory analyses of environmental samples.

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2. PROJECT DESCRIPTION

This section describes the general scope of work and project objectives for the activities to be performed at the Site. Additional information is presented in the Work Plan.

2.1 PROJECT SCOPE

The purpose of the groundwater investigation is to provide information as to whether there are constituents present in the groundwater at the Burton Parcel at concentrations that exceed the Michigan Department of Natural Resources and Environment (MDNRE) Part 201 Cleanup criteria.

The Groundwater Investigation will involve the collection of groundwater samples from monitoring wells at the Site to assess groundwater flow off the Site and the potential presence and relative concentrations of constituents in the groundwater samples. Based on historical information, the constituents of concern for the investigation include the following:

- Volatile organic compounds (VOCs)
- Metals including arsenic, barium, lead and zinc

The groundwater samples will be submitted to Merit Laboratories, Inc. (primary laboratory) or TestAmerica, Inc. (secondary laboratory) for analyses.

2.1.1 Laboratory Analysis

The groundwater samples will be submitted to the laboratory for the following analyses:

- VOCs by gas chromatography/ mass spectrometry
- Metals by inductively coupled plasma.

Table 1 presents the analytical methods, sample collection containers and volumes, preservation, holding times and associated quality control (QC) sample frequency.

Field duplicates, matrix spike/matrix spike duplicates (MS/MSD), trip blanks, field blanks and equipment blanks will be collected for this investigation.

The target analytes are listed in Tables 2-1 and 2-2.

The QC requirements and corrective actions listed in Tables 3-1 and 3-2, which supplement the method requirements, are to be followed by the laboratory.

The laboratory will report non-detected results to the method detection limits (MDLs). For the remaining data, results that are less than the quantitation limits (QLs) but greater than the MDLs will be reported using the "J" flag. The QLs and MDLs listed in Tables 2-1 through 2-2, or the most recent MDLs and QLs, will be reported by the laboratories. The tables also present the applicable MDNRE Part 201 cleanup criteria, which will be used to evaluate the analytical data.

The laboratory will provide sample containers for the investigation, prepared in accordance with method requirements.

Communications with O'Brien & Gere will be documented by the laboratory in the data packages.

The analytical data will be reported in both hardcopy and electronic data format.

2.1.2 Documentation

Data will be managed in a relational database management system (DBMS). Laboratory analytical data will be provided in electronic disk deliverable (EDD) format for direct upload into the DBMS.

Following receipt of the laboratory data, a report will be completed. The report will include a summary discussion of the activities completed during the field investigation and the results of the analyses.

Records will be incorporated into the final project files for the samples. The field logs, data packages, and records will be included in the project files, which will be archived by O'Brien & Gere for a period of ten years.

3. DATA QUALITY OBJECTIVES AND CRITERIA

The Data Quality Objective (DQO) Process, as it has been applied to this investigation, comprises the following steps, consistent with guidance presented in the United States Environmental Protection Agency (USEPA) *Guidance for the Data Quality Objectives Process* (EPA QA/G-4), February 2006. The DQO process establishes the acceptance criteria, which serve as the basis for collecting data of sufficient quality and quantity to support the goals of the project activities.

3.1 DQO PROCESS

The process consists of the following seven iterative steps for the DQO process:

- *Step 1 – State the Problem* – The investigation will provide information pertaining to groundwater flow direction and the potential presence and concentrations of constituents in the groundwater collected from the groundwater monitoring wells (see Figure 3 of the Work Plan) at concentrations that exceed MDNRE Part 201 groundwater residential and industrial generic cleanup criteria listed in Tables 2-1 and 2-2.
- *Step 2 – Identify the Goal of the Study* – The activities defined in this QCD will be utilized to identify the constituents in the groundwater above the MDNRE Part 201 cleanup criteria in the groundwater at the Site.
- *Step 3 – Identify Information Inputs (i.e., the data types required before project decisions can be made)* – The primary required data types will be analytical results from groundwater samples that will be collected from the Site.
- *Step 4 – Define the Boundaries of the Study (i.e., the spatial and temporal features pertinent for decision making)* – Groundwater samples will be collected from the eleven newly installed monitoring points. The locations were selected to provide information for groundwater flow and contamination at the Site.
- *Step 5 – Develop the Analytical Approach (i.e., how will the study results be analyzed and conclusions made from the data)* – If groundwater flow is assessed to be south, southeast or east and property boundary wells groundwater samples exhibit concentrations that exceed MDNRE Part 201 cleanup criteria (presented in Tables 3-1 and 3-2), further investigation may be performed to investigate the groundwater impact.
- *Step 6 – Specify Performance or Acceptance Criteria (i.e., performance or acceptance criteria that the collected data will need to achieve)* – Data must be of known quality to withstand scientific and legal challenges relative to its intended purpose. Completeness is the measure of the amount of valid data obtained from a measurement system compared to the amount expected to be obtained under normal conditions. If the completeness objective of 95% is not met, additional sampling may be justified.
- *Step 7 – Develop the Plan for Obtaining Data* – The groundwater samples will be collected and analyzed as described in the Work Plan and this QCD.

To meet the DQOs for this investigation, the groundwater results will be compared to the following MDNRE criteria and screening levels (presented in Tables 3-1 and 3-2), where applicable:

- MDNRE Groundwater Residential and Industrial-Commercial Part 201 Generic Cleanup Criteria and Screening Levels, current as of June 2010.

If the standards are not exceeded, no further sampling is anticipated. If the standards are exceeded, additional samples may be collected.

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4. PROJECT ORGANIZATION AND RESPONSIBILITY

O'Brien & Gere will be responsible for project management and sample collection. The groundwater samples will be submitted to Merit Laboratories, Inc. of East Lansing, Michigan. In the event Merit cannot perform groundwater analysis, the groundwater samples will be sent to TestAmerica, Inc. of North Canton, Ohio.

4.1 O'BRIEN & GERE KEY PERSONNEL

4.1.1 O'Brien & Gere Project Officer

Scott Cormier, P.E., is the O'Brien & Gere Project Officer and has overall responsibility for meeting the stated project objectives. In addition, he is responsible for providing the O'Brien & Gere Project Manager with access to O'Brien & Gere corporate resources.

4.1.2 O'Brien & Gere Project Manager

Anthony Finch, C.P.G., is the O'Brien & Gere Project Manager and is responsible for implementing the project. He has the authority to commit the resources necessary to meet project objectives and requirements. His primary function is to meet the technical, financial, and scheduling objectives and will provide direction to O'Brien & Gere Project Team.

4.1.3 O'Brien & Gere QA Officer

Karen Storne is the O'Brien & Gere QA Officer (QAO) for this project. She will manage and be responsible for QA/QC review of data generated during the investigation. The QAO will be responsible for follow-up and oversight of corrective action implementation, to the satisfaction of the client and the MDNRE representative.

4.1.4 O'Brien & Gere Field Investigation Manager

The O'Brien & Gere Field Investigation Manager and will be responsible for directing and coordinating the day-to-day activities while field activities are underway.

4.1.5 Field Sampling Personnel

O'Brien & Gere field sampling personnel will be responsible for collection, packaging, preservation, and shipping of environmental samples in accordance with the Work Plan, QCD, and applicable MDNRE requirements.

4.2 LABORATORY MANAGEMENT

The samples will be submitted to Merit Laboratories, Inc. of East Lansing, Michigan or TestAmerica, Inc. of North Canton, Ohio.

4.2.1 Laboratory Project Manager

The Laboratory Project Manager will be responsible for:

- Coordinating laboratory analysis
- Supervising in-house chain-of-custody
- Scheduling sample analysis
- Overseeing data review
- Overseeing preparation of analytical reports.

It will also be the responsibility of the Laboratory Project Manager to approve final analytical reports prior to submission to O'Brien & Gere.

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5. SAMPLING HANDLING AND CUSTODY

5.1 SAMPLE CUSTODY AND PROCEDURES

Chain-of-custody procedures will be instituted and followed throughout the investigation. These procedures include field custody, laboratory custody, and evidence files. Samples are physical evidence and will be handled according to strict chain-of-custody protocols. The O'Brien & Gere QAO must be prepared to produce documentation that traces the samples from the field to the laboratory and through analysis. USEPA has defined custody of evidence as follows:

- In actual possession
- In view after being in physical possession
- In a locked laboratory
- In a secure, restricted area.

5.2 SAMPLE PREPARATION

The analytical laboratory will supply appropriate sample containers for groundwater samples in coolers, as well as preservatives.

QA measures for this project will begin with the sample containers; pre-cleaned containers will be purchased from a USEPA-certified manufacturer (I-Chem 200 or equivalent).

Immediately after collection, samples will be transferred to properly labeled sample containers, and properly preserved. Table 1 lists the proper sample container, sample volumes, preservation, and holding times. Samples requiring refrigeration for preservation will be promptly transferred to coolers packed with wet ice and/or ice packs. If field storage is required, the samples will be stored in a secured storage facility and a cooler temperature of 4 °C will be maintained.

5.3 FIELD CUSTODY PROCEDURES

The field sampler is personally responsible for the care and custody of the sample until transferred.

The field logbook will be used to note information regarding collection of samples and any observations. All entries will be signed and dated. Field logbooks will be waterproof and bound. The logbook will be dedicated to the project and pages will not be removed. Corrections will be made by drawing a single line through the incorrect data and initialing and dating the correction that was made to the side of the error. An initialed diagonal line will be used to indicate the end of an entry or the end of the day's activities.

The following information will be recorded in the field logbook by the field sampling team:

- Name and title of author, date, and time of site entry, and physical/environmental conditions during the field activity
- Meteorological data
- Project number, client name, and Site name
- Name and title of field crew members
- Sample media
- Sample collection method, including equipment utilized
- Number and volume of samples collected
- Description of sample locations

- Date and time of sample collection
- Diagrams of sampling process
- Sample and QA/QC identification numbers
- Sample distribution
- Field observations
- Field measurements made and equipment used
- Calculations, results, and calibration data for field sampling and measurements
- References for maps and photographs of the sample location
- Dates and method of sample shipments.

A completed sample identification label or tag that will be sequentially numbered, will be attached to each investigative or QC sample and the sample placed in a shipping container. The identification on the label/tag must be sufficient to enable cross-reference with the logbook. The sample label/tag will be recorded using waterproof, non-erasable ink and will be attached to the sample container using adhesive.

The sample labels/tags will contain the following information:

- Sample number identification
- Project number
- Date and time of sample collection
- Designation of the sample as a grab or composite
- Type of sample matrix
- Sample location
- Signature of the sampler
- Whether the sample is preserved or unpreserved
- Space for laboratory sample number (only on the sample tag)
- General types of analysis to be performed.

5.4 CHAIN-OF-CUSTODY PROCEDURES

Chain-of-custody records will be kept starting at the time that sample containers are placed in the coolers for transportation to the laboratory. One completed chain-of-custody record must be kept with each sample cooler at all times.

An example chain-of-custody form is provided in the laboratory's Quality Assurance Manual (QAM).

The following measures will be taken when completing a chain-of-custody record:

- Chain-of-custody forms will be completed in waterproof, non-erasable ink.
- Chain-of-custody forms will be completed neatly using printed text. If a simple mistake is made, the error will be lined out with a single line and initialed and dated.
- Each separate sample entry will be sequentially numbered.
- The use of "Ditto" or quotation marks to indicate repetitive information in columnar entries should be avoided. If numerous repetitive entries must be made in the same column, a continuous vertical arrow will be used between the first entry and the next different entry.

- When more than one chain-of-custody form is used for a single shipment, each form will be consecutively numbered using the "Page ___ of ___" format.
- If necessary, additional instructions will be placed directly onto the chain-of-custody form.
- Acronyms used on a chain-of-custody form will be defined.

The chain-of-custody form will contain the following information:

- Project identification and number
- Sample description/location
- Required analysis
- Date and time of sample collection
- Type and matrix of sample
- Number of sample containers
- Analysis requested/comments
- Sampler signature/date/time
- Date and signature of the field representative
- Date and signature of the laboratory representative
- Carrier used to ship coolers
- Air bill number (if shipped by a commercial carrier).

In the case that high concentrations are suspected to be present in the samples, a note to that effect will be included on the chain-of-custody form.

Environmental samples will be packed prior to shipment using the following procedures:

- Select a sturdy cooler in good repair and clean. Secure and tape the drain plug with fiber or duct tape.
- Air samples do not require preservation and may be shipped using alternative shipping containers.
- Be sure the lids on all bottles are tight (will not leak) and baggies are sealed.
- Where applicable, put ice that has been placed in heavy-duty polyethylene bags and properly sealed on top of or between the samples. Pack samples securely to eliminate breakage during shipment with ice packs to maintain the inside temperature at approximately 4°C.

Sampling containers will be packed with packing materials. When possible, sample container preparation and packing for shipment will be completed in a well-organized and clean area.

- Sample containers will be prepared for shipment by wiping containers clean of debris/water using paper towels. Paper towels will be disposed with the personal protective equipment (PPE).
- Place chain-of-custody record into a Ziploc plastic bag, tape the bag to the inner side of the cooler lid, and close the cooler and securely tape (preferably with fiber tape) the top of the cooler shut. Two custody seals will be affixed to the latch and lid of the cooler. The number of the security seal will be recorded on the chain-of-custody form. The custody seals will consist of adhesive-backed tape that easily rips if it is disturbed. The field sampler will initial and date the seal. The seals must be broken to open the cooler and will indicate tampering if the seal is broken before receipt at the laboratory.
- A label containing the name and address of the shipper will be placed on the outside of the container.

The field sampling team will transport or ship the cooler via an overnight delivery service or will hand deliver it to the laboratory. Prior to shipment of sample coolers, the field sampling team will contact the laboratory to notify the laboratory of the shipment.

Samples will remain in the custody of the sampler until transfer of custody is completed. Transfer consists of:

- Delivery of samples to the Laboratory Sample Custodian; and/or
- Signature of the Laboratory Sample Custodian on the chain-of-custody form as receiving the samples and signature of sampler as relinquishing the samples.

The field sampling team will ship by commercial carrier the coolers containing environmental samples to the laboratories identified for this project. Samples will not be shipped to another laboratory without the permission of the O'Brien & Gere Project Manager.

The chain-of-custody document will be completed by the field sampler and provided for each sample cooler. When transferring the possession of samples, individuals relinquishing and receiving will sign, date, and note the time on the chain-of-custody. Custody of samples must be continuous between parties and time gaps must not be present. Each shipment of samples to the laboratory must have its own chain-of-custody record with the contents of the shipment, method of shipment, name of courier, and other pertinent information written on the record. The original record accompanies the shipment and the copies are kept with the field logbook and distributed to the O'Brien & Gere Project Manager. A copy of the chain-of-custody will be faxed to the laboratory and to the Project Manager on the same day of sample shipment. Freight bills, postal service receipts, and bills of lading will be retained as permanent documentation.

If a carrier is used to take samples between the sampler and the laboratory, the air bill number must be written on the chain-of-custody.

Samples will be shipped or transported within 24 hours of being collected and will arrive at the laboratory no later than 48 hours after sample collection.

5.5 LABORATORY CHAIN-OF-CUSTODY PROCEDURES

Laboratory custody procedures continue when the samples are received by the laboratory. When the samples arrive at the laboratory, the Laboratory Sample Custodian will sign the courier's air bill or bill of lading (unless hand-delivered) and will note the cooler temperature on the chain-of-custody form. If the cooler temperature is greater than 6 °C, the O'Brien & Gere Project Manager will be notified. If the samples were shipped, the courier's air bill number will be attached to the chain-of-custody and the air bill number will be written on the chain-of-custody form. If the cooler arrives at the laboratory after hours, an external chain-of-custody will be properly filled out and will accompany the cooler until the laboratory receives the cooler.

The Laboratory Sample Custodian's duties and responsibilities upon sample receipt will be to:

- Document receipt of samples by signing the record with the date and time of sample receipt.
- Note the cooler temperature on the chain-of-custody form.

- Inspect sample shipping containers for the presence or absence of custody seals (only if shipped via overnight courier) and for container integrity.
- Document canister pressures for air samples and notify the O'Brien & Gere Project Manager if pressure requirements are not met.
- Sign the appropriate forms or documents, verify, and record the agreement or disagreement of information on sample documents and, if there are discrepancies, record the problem and notify the O'Brien & Gere Project Manager.
- Assign a number for each sample upon receipt. That sample number will be placed on the sample label which will remain attached to the sample container.
- Log sample information into the laboratory sample tracking system.
- Label sample with a unique, sequential laboratory sample number.
- Place samples in the walk-in cooler or sample storage area that is a secure, limited-access storage.

The laboratory will immediately contact the O'Brien & Gere Project Manager if issues pertaining to sample condition or documentation are detected (*e.g.*, broken security seal; broken, open, or otherwise compromised sample containers; chain-of-custody information in disagreement with sample labels).

At the laboratory, the analysts will be required to log samples and extracts in and out of storage as the analysis proceeds.

There must not be a lapse in the custody for the sample containers and canisters and exchanges of custody must be documented on the form. Samples will be returned to secure storage at the close of business. Care must be exercised to properly complete, date, and sign records needed to generate the data package.

Procedures to be followed by the laboratory include:

- Samples will be handled by the minimum number of people possible.
- The laboratory will set aside a secured sample storage area consisting of a clean, dry, refrigerated, isolated room.
- A specific person will be designated sample custodian. Incoming samples will be received by the custodian who will indicate receipt by signing the chain-of-custody form.
- The custodian will ensure that samples which are heat-sensitive, light-sensitive, radioactive, or which require special handling in other ways, are properly stored and maintained prior to analysis.
- The analytical area will be restricted to authorized personnel only.
- After sample analyses are complete, the analytical data will be kept secured and released to authorized personnel only.

5.6 FINAL EVIDENCE FILES

The final evidence file will be the central repository for documents that constitute evidence relevant to sampling and analysis activities as described in this QCD. O'Brien & Gere is the custodian of the evidence file and maintains the contents of evidence files for the Site, including relevant records, reported, logs, field notebooks, pictures, subcontractor reports, and data reviews.

Copies of the laboratory data packages will be stored by the laboratory for incorporation into the sample file. The Laboratory Project Manager will be responsible for laboratory data packages.

Upon completion of the analyses, the Laboratory Project Manager will begin assimilating the field and laboratory data. In this way, the file for the samples will be generated. The final file for the sample will be stored at O'Brien & Gere and will consist of the following:

- Laboratory data packages, including summary and raw data from the analysis of environmental and QC samples, chromatograms, mass spectra, calibration data, work sheets, and sample preparation log
- Chain-of-custody records
- Field notebooks and data
- Field collection report
- Pictures and drawings
- Progress and QA reports
- Contractor and subcontractor reports
- Correspondence.

The evidence file must be maintained in a secured, limited access area until submittals for the project have been reviewed and approved, and for a minimum of ten years past the submittal date of the final report.

6. LABORATORY QA/QC PROCEDURES

A brief description of laboratory QA/QC analyses is presented in the following sections.

6.1 GC/MS TUNING

Tuning and performance criteria are established to verify mass resolution, identification, and to some degree, instrument sensitivity. These criteria are not sample specific; conformance is determined using standard materials. Therefore, these criteria should be met in all circumstances.

6.2 CALIBRATION

Compliance requirements for satisfactory instrument calibration are established to verify that the instrument is capable of producing acceptable quantitative data. Initial calibration demonstrates that the instrument is capable of acceptable performance at the beginning of analysis, and continuing calibration and performance checks document satisfactory maintenance and adjustment of the instrument on a day-to-day basis.

6.3 BLANKS

Corrective action procedures are implemented for blank analyses if target compounds are detected at concentrations greater than the requirements presented in corrective action Tables 3-1 and 3-2. The criteria for evaluation of blanks apply to any blank associated with a group of samples. If problems with a blank exist, data associated with the project must be carefully evaluated to determine whether or not there is an inherent variability in the data for the project, or if the problem is an isolated occurrence not affecting other data.

6.4 INTERNAL STANDARDS PERFORMANCE

Internal standards, which are compounds not found in environmental samples, will be spiked into samples, blanks, and laboratory control samples (LCSs) at the time of sample preparation for applicable methods. Internal standards will meet the criteria specified in the corrective action tables.

6.5 SURROGATE EVALUATION

Accuracy and matrix biases for individual samples are monitored for organic analyses using surrogate additions for applicable methods. Surrogates are compounds similar in nature to the target analytes; the surrogates are spiked into environmental samples, blanks, and quality control samples prior to sample preparation for organic analyses. The evaluation of the results of these surrogate spikes is not necessarily straightforward. The sample itself may produce effects due to such factors as interferences and high concentrations of analytes. Since the effects of the sample matrix are frequently outside the control of the laboratory and may present relatively unique problems, the review and validation of data based on specific sample results is frequently subjective.

6.6 LABORATORY CONTROL SAMPLES

LCSs are standard solutions that consist of known concentrations of the complete list of target analytes spiked into laboratory analyte-free matrix. They are prepared or purchased from a certified manufacturer from a source independent from the calibration standards to provide an independent verification of the calibration procedure. These QC samples are then prepared and analyzed following the same procedures employed for environmental sample analysis to assess method accuracy independently of sample matrix effects. The laboratory prepares and analyzes a LCS with each group of twenty samples of similar matrix that are extracted, digested, or analyzed at the same time. Percentage recoveries are evaluated to assess the efficiency of the preparation and analysis method independent of environmental sample matrix effects.

6.7 ANALYTE IDENTIFICATION AND QUANTITATION

The objective of the qualitative criteria is to minimize the number of erroneous identifications of compounds. An erroneous identification can either be a false positive (reporting a compound present when it is not) or a false negative (not reporting a compound that is present). The identification criteria can be applied much more easily in detecting false positives than false negatives. Negatives, or non-detected compounds, on the other hand represent an absence of data and are, therefore, much more difficult to assess. The objective for quantitative

requirements is to maximize the accuracy of data and sensitivity of the instrument. Unless sample screening indicates the presence of high concentration target analytes, samples are analyzed undiluted to maximize sensitivity. Samples are reanalyzed at the appropriate dilution when concentrations exceed the linear calibration range to maximize accuracy.

Interferences are identified and documented. Samples are diluted only if analytes of concern generate responses in excess of the linear range of the instrument.

6.8 CORRECTIVE ACTION

Generally, the following corrective actions are taken by the laboratory. When calibration, instrument performance, and blank criteria are not met, the cause of the problem is located and corrected. The analytical system is then recalibrated. Sample analysis does not begin until calibration, instrument performance, and blank criteria are met. When reference standard analyses are out of control, the analyses of these samples are investigated. Depending on the results of the overall QC program for the sample set, the data may be accepted, accepted with qualification, or determined to be unusable.

6.9 PREVENTIVE MAINTENANCE

Preventative maintenance procedures are carried out on laboratory equipment in accordance with the laboratory procedures. Maintenance activities involving are recorded in laboratory documents.

7. FIELD QA/QC PROCEDURES

A brief description of field QA/QC samples is presented in the following sections.

7.1 MATRIX SPIKE/MATRIX SPIKE DUPLICATES

MS and MSD samples are collected from the same location as the parent sample and are analyzed for the same parameters as the parent sample. Each sample will be labeled with the sample number as the original sample, designated as MS or MSD samples, and submitted to the laboratory for the appropriate analyses. One MS/MSD sample set will be collected for every twenty samples submitted to the laboratory or one MS/MSD for less than twenty samples for each matrix type.

7.2 FIELD DUPLICATE (REPLICATE) SAMPLES

Collection of field duplicate or replicate samples provides for the evaluation of the laboratory's performance by comparing analytical results of two samples from the same location. Field duplicate samples are also collected to evaluate field sample collection procedures. Field duplicate samples are samples that have been divided into two portions and will be analyzed for the same parameters. The field duplicate will be labeled with fictitious identification locations and times, and submitted to the laboratory as regular samples. The actual identification of the field duplicate sample will be recorded in the field logbook. One field duplicate sample will be collected for each analytical group or one per matrix type each day of sample collection.

7.3 CO-LOCATED SAMPLES

Co-located samples are independent samples collected from the same location using the same sample collection method as was used for the environmental sample. Co-located samples are not mixed together and then split into two samples. The primary purpose of co-located samples is to evaluate the precision for the entire measurement system, including variability due to the site, the sampling procedures, and the laboratory process. When evaluated with other controls, it is useful to evaluate the potential for sampling error and possibly isolate the cause of unacceptable variability. One co-located sample will be collected for every ten environmental samples or one for each matrix type.

7.4 FIELD BLANKS (CONTAINER BLANKS)

Field blanks are created by pouring analyte-free water directly into sample containers in the area where sample handling and preservation operations occur. Field blanks undergo shipment from the sampling site to the laboratory in coolers with the environmental samples and will be handled in the same manner as environmental samples. Field blanks are analyzed to evaluate sample handling, preservation and shipping procedures. One field blank will be collected for every twenty samples or for each matrix type.

7.5 EQUIPMENT BLANKS (RINSATE BLANKS)

Equipment blanks are created by pouring analyte-free water through or over a piece of sampling equipment and collecting rinsate in a sample container. The Equipment blank undergoes shipment from the sampling site to the laboratory in coolers with the environmental samples. Equipment blanks will be handled in the same manner as environmental samples. Equipment blanks are analyzed to assess potential contamination introduced during field decontamination procedures and sample shipment. An equipment blank will not be required if clean disposable equipment is used for sample collection. One equipment blank will be collected for every ten samples or one per day for each matrix type.

7.6 TRIP BLANKS

Trip blanks will be prepared as the other preservation containers and will contain analyte-free solvent. The trip blank will undergo shipment from the sampling site to the laboratory in coolers with the environmental samples to be analyzed for VOCs. Trip blanks will be analyzed for VOCs to determine if contamination has taken place during sample handling and/or shipment. Trip blanks will be utilized for samples at a frequency of one each per shipment per cooler sent to the laboratory for VOCs. The temperature of the samples will be measured at the laboratory upon receipt of the sample cooler to verify compliance with the cooler temperature requirement.

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8. DATA VALIDATION AND USABILITY

Data validation will be performed on the data from the samples collected for the Groundwater Investigation. Data validators from O'Brien & Gere will provide data validation services.

Upon request by the data validator, the laboratory will provide additional or supplemental information within three working days of the request.

8.1 VALIDATION PROCEDURES

Partial data validation will be performed on the samples submitted for VOC and metal analyses as defined below.

Data will be evaluated during validation using the QA/QC criteria established in the analytical methods utilized by the laboratory, the quality control requirements and corrective actions listed in Tables 3-1 and 3-2, and laboratory established control limits.

Partial validation consists of a review of only analytical QC summary forms that are included in the data package. The forms and the information contained on the forms are not evaluated for accuracy or completeness during the partial validation process. Raw data evaluation and calculation checks will not be performed as part of this validation approach.

The following QA/QC information will be included in the partial validation, where applicable:

- Chain-of-custody record
- Sample collection
- Sample preservation
- Holding times
- Blank analysis
- MS/MSD analysis
- Laboratory control sample (LCS) analysis
- Field duplicate and co-located analyses
- Surrogate recovery (organics)
- Internal standards performance (organics and metals)
- ICP serial dilution analysis (metals)
- Laboratory duplicate analysis (metals)

8.2 ASSIGNMENT OF QUALIFIERS

Data affected by excursions from the previously described QA/QC criteria will be qualified using the following data validation guidance documents, or the most current documents, and professional judgment:

- USEPA. 1999. USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review, EPA-540/R-99-008. Washington D.C.
- USEPA. 2004. USEPA Contract Laboratory Program National Functional Guidelines For Inorganic Data Review, EPA 540/R-04-004. Washington D.C.

The application of these validation guidelines will be modified to reflect method and QCD requirements, where applicable.

The validation approach to be taken by O'Brien & Gere will be a conservative one. Qualifiers will be applied to sample data to indicate minor excursions detected in comparison to method and validation criteria. In this way, data associated with excursion identified during the partial validation will be identified to the data user. Major

excursions will result in data being rejected, indicating that the data are considered unusable for either quantitative or qualitative purposes. Minor excursions will result in sample data being qualified as approximate.

In accordance with validation guidance, and using professional judgment, data qualifiers may include the following:

- 1) U – Indicates that the analyte was analyzed for, but was not detected. The associated value indicates approximate sample concentration necessary to be detected. The sample QL is presented and adjusted for dilution.
- 2) J – Indicates that the detected analyte is present but the reported value may not be accurate or precise. The result should be considered approximate based on excursions from QA/QC criteria.
- 3) UJ – Indicates that the analyte was not detected and the result should be considered approximate based on excursions from QA/QC criteria.
- 4) R – Indicates that the QL or sample result is unreliable and has been rejected due to a major excursion from QA/QC criteria. The analyte may or may not be present in the sample. The data should not be used for qualitative or quantitative purposes.

8.3 DATA USABILITY EVALUATION

Data usability with respect to the DQOs and data uses will be compared to the project requirements. In the event that the completeness objective of 95% is not achieved, samples will be recollected at the discretion of the O'Brien & Gere Project Manager.

Based on the QA/QC information review and the qualifiers assigned to the analytical data, an overall evaluation of the data's usability will be performed. Data usability is defined as the percentage of data that remains unqualified or is qualified as approximate or non-detected due to blank contamination, divided by the data reported by the laboratory times 100.

8.4 DATA VALIDATION REPORT

The data validation report will contain separate QA sections in which data quality information collected during the investigation is summarized. The validation report will include the following:

- Guidelines used to evaluate the data
- Data qualifiers applied to sample results
- Summary of samples collected and analyses performed
- Narrative that identifies major and minor analysis excursions detected for each parameter evaluated for each analysis
- Additional issues and information that may be beneficial to the data user
- Data summary forms.

The data validation report will be prepared under the direction of the QAO and will include the report on the usability of the data.

Limitations of the data usability will be reported through the data validation report. The data validation report will describe the reasons for data qualification and the Groundwater Investigation Report will summarize the impact of the qualified data on the data usage.

REFERENCES

- O'Brien & Gere. 2010. *Burton Parcel Groundwater Investigation Work Plan, Burton, Michigan*. Farmington Hills, Michigan.
- USEPA. 1999. *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review, EPA-540/R-99-008*. Washington D.C.
- USEPA. 2004a. *USEPA Contract Laboratory Program National Functional Guidelines For Inorganic Data Review, EPA 540/R-04-004*. Washington D.C.
- USEPA. 2004b. *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846, 3rd Edition, Update IIIB*. Washington D.C.

TABLES

Table 1. Field Sampling Summary

Parameter (Method)	Matrix	Sample Containers and Volumes	Preservation	Holding Times	Number of Investigative Samples	QC sample frequency					
						Co-Located Sample	Field Duplicate	Trip Blank	MS/MSD	Equipment (Rinsate) Blank	Field (Container) Blank
VOCs (USEPA Methods 5030B/8000C/8260B) ¹	Groundwater	3 40-milliliter glass vials with Teflon® lined septum caps	<6°C HCL to pH≤2 FC Sealed and Headspace Free	Analysis within 14 days from collection for preserved samples. Analysis within 7 days from collection for samples not acid preserved.	11	One per 10 samples or one per matrix type	One per each analytical group or one per matrix for each day of sampling	1 each in cooler with VOC samples	One per 20 samples or one per matrix (for less than 20 samples)	One per 10 samples or one per day for each matrix	One per 20 samples or for each matrix
Vinyl chloride Styrene (USEPA Methods 5030B/8000C/8260B) ¹	Groundwater	3 40-milliliter glass vials with Teflon® lined septum caps	<6°C Sealed and Headspace Free No acid preservation*	Analysis within 14 days from collection for preserved samples. Analysis within 7 days from collection for samples not acid preserved.	11	One per 10 samples or one per matrix for each day	One per each analytical group or one per matrix for each day	1 each in cooler with VOC samples	One per 20 samples or one per matrix (for less than 20 samples)	One per 10 samples or one per day for each matrix	One per 20 samples or one per day for each matrix
Metals (USEPA Methods 3010A/6010B) ¹	Groundwater	1-250 milliliter polyethylene or fluorocarbon (TFE or PFA) container. 100 milliliters sample volume required.	<6°C HNO ₃ to pH<2	180 days from collection to analysis	11	One per 10 samples or one per matrix for each day	One per each analytical group or one per matrix for each day	NA	One per 20 samples or one per matrix (for less than 20 samples)	One per 10 samples or one per day for each matrix	One per 20 samples or one per day for each matrix

NOTES:
 * If carbonaceous material or methyl tert butyl ether present or other fuel oxygenated ether present and a high temperature sample preparation method used, do not preserve. If free chlorine is present in the sample, appropriate addition of sodium thiosulfate solution as described in the method must be performed.
 **MS/MSD indicates matrix spike/matrix spike duplicate sample for organic analyses. Spike duplicate may be performed for inorganic analyses.
 *** Equipment blank is not required if disposable equipment is used.

FC indicates that if free chlorine is present in samples, it must be removed by the appropriate addition of sodium thiosulfate or ascorbic acid.
 VOCs indicates volatile organic compounds.

1. United States Environmental Protection Agency (USEPA). 2004. *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846*, 3rd Edition, Update IIB. Washington D.C.

Source: O'Brien & Gere

Table 2-1. Laboratory MDLs, QLs, and MDNRE criteria for VOCs in groundwater

Target Analyte	USEPA Method	QL (ug/L)	MDL (ug/L)	MDNRE Residential & Commercial I Drinking Water Criteria & RBSLs (ug/L)
Chloromethane	8260B	1	0.5	260
Vinyl Chloride	8260B	1	0.4	2.0 (A)
Bromomethane	8260B	1	0.6	10
Chloroethane	8260B	1	0.5	430
Acetone	8260B	10	3.3	730
1,1-Dichloroethene	8260B	1	0.4	7.0 (A)
Methylene chloride	8260B	1	0.4	5.0 (A)
Carbon disulfide	8260B	1	0.3	800
trans-1,2-Dichloroethene	8260B	1	0.4	100 (A)
1,1-dichloroethane	8260B	1	0.5	880
2-Butanone	8260B	10	0.8	13000
cis-1,2-Dichloroethene	8260B	1	0.4	70 (A)
Chloroform	8260B	1	0.4	80 (A,W)
1,2-Dichloroethane	8260B	1	0.3	5.0 (A)
1,1,1-Trichloroethane	8260B	1	0.3	200 (A)
Carbon tetrachloride	8260B	1	0.3	5.0 (A)
Benzene	8260B	1	0.4	5.0 (A)
1,2-Dichloropropane	8260B	1	0.5	5.0 (A)
Trichloroethene	8260B	1	0.4	5.0 (A)
Bromodichloromethane	8260B	1	0.3	80 (A,W)
cis-1,3-Dichloropropene	8260B	1	0.3	8.5
4-Methyl-2-pentanone	8260B	10	0.5	1800
trans-1,3-Dichloropropene	8260B	1	0.4	8.5
1,1,2-Trichloroethane	8260B	1	0.6	5.0 (A)
Toluene	8260B	1	0.4	790 (E)
Dibromochloromethane	8260B	1	0.4	80 (A,W)
2-Hexanone	8260B	10	0.5	1000
Tetrachloroethene	8260B	1	0.3	5.0 (A)
Chlorobenzene	8260B	1	0.3	100 (A)
Ethylbenzene	8260B	1	0.3	74 (E)
Bromoform	8260B	1	0.3	80 (A,W)
Xylene (total)*	8260B	2	0.9	280 (E)
Styrene	8260B	1	0.27	100 (A)
1,1,2,2-Tetrachloroethane	8260B	1	0.4	8.5
Isopropylbenzene	8260B	1	0.3	800
n-Propylbenzene	8260B	1	0.3	80
1,3,5-Trimethylbenzene	8260B	1	0.2	72 (E)
tert-Butylbenzene	8260B	1	0.3	80
n-Butylbenzene	8260B	1	0.3	80
1,2,4-Trimethylbenzene	8260B	1	0.3	63 (E)
sec-Butylbenzene	8260B	1	0.3	80
1,3-Dichlorobenzene	8260B	1	0.2	6.6
1,4-Dichlorobenzene	8260B	1	0.3	75 (A)
p-Isopropyltoluene	8260B	1	0.3	NL
1,2-Dichlorobenzene	8260B	1	0.3	600 (A)
Naphthalene	8260B	1	0.3	520

Notes:

QL indicates quantitation limit. Note: QLs vary depending on sample matrix and dilutions.

MDL indicate method detection limit.

MDNRE indicates Michigan Department of Natural Resources and Environment.

MDNRE Groundwater Residential and Industrial-Commercial Part 201 Generic Cleanup Criteria, current as of June 2010.

ug/L indicates micrograms per liter.

NL indicates not listed.

* Merit analyzes Xylenes as p,m-Xylene and o-Xylene separately.

(A) Criterion is the state of Michigan drinking water standard established pursuant to Section 5 of 1976 PA 399, MCL 325.1005

(E) Criterion is the aesthetic drinking water value, as required by Section 20120a(5) of the Natural Resources and Environment PA 451, as amended (NREPA).

(W) Concentrations of trihalomethanes in groundwater shall be added together to determine compliance with the Michigan drinking water standard of 80 ug/L. Concentrations of trihalomethanes in soil shall be added together to determine compliance with the drinking water protection standard of 100 ug/kg.

Method reference:

1. United States Environmental Protection Agency (USEPA). 2004. *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*, SW-846, 3rd Edition, Update IIIB. Washington D.C.

Table 2-2. Laboratory MDLs, QLs, and MDNRE criteria for metals in groundwater.

Target Analyte	USEPA Method	Merit QL (ug/L)	Merit MDL (ug/L)	TestAmerica QL (ug/L)	TestAmerica MDL (ug/L)	MDNRE Residential & Commercial I Drinking Water Criteria & RBSLs (ug/L)	MDNRE Industrial & Commercial II, III & IV Drinking Water Criteria & RBSLs (ug/L)
Arsenic	USEPA Methods 6010B/6020	0.1	0.029	5	0.4	10 (A)	10(A)
Barium	USEPA Methods 6010B/6020	0.5	0.085	1	0.19	2000 (A)	2000 (A)
Lead	USEPA Methods 6010B/6020	0.5	0.037	1	0.18	4 (L)	4 (L)
Zinc	USEPA Methods 6010B/6020	0.5	0.132	20	2.3	2400	5000 (E)

Notes:
 QL indicates quantitation limit. Note: QLs vary depending on sample matrix and dilutions.
 MDL indicate method detection limit.
 ug/L indicates micrograms per liter.
 NL Indicates not listed.
 MDNRE indicates Michigan Department of Natural Resources and Environment.
 MDNRE Groundwater Residential and Industrial-Commercial Part 201 Generic Cleanup Criteria and Screening Levels, current as of June 2010.
 (A) Criterion is the state of Michigan drinking water standard established pursuant to Section 5 of 1976 PA 399, MCL 325.1005.
 (E) Criterion is the aesthetic drinking water value, as required by Section 20120a(5) of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA).
 (L) Criteria for lead are derived using a biologically based model, as allowed for under Section 20120a(10) of the NREPA, and are not calculated using the algorithms and assumptions specified in pathway-specific rules. The generic residential drinking water criterion of 4 ug/L is linked to the generic residential soil direct contact criterion of 400 mg/kg. A higher concentration in the drinking water, up to the state action level of 15 ug/L, may be allowed as a site-specific remedy and still allow for drinking water use, under Section 20120a(2) of the NREPA if soil concentrations are appropriately lower than 400 mg/kg. If a site-specific criterion is approved based on this subdivision, a notice shall be filed on the deed for all property where the groundwater concentrations will exceed 4 ug/L to provide notice of the potential for unacceptable risk if soil or groundwater concentrations increase.

Method reference:
 1- United States Environmental Protection Agency (USEPA). 2004. Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846, 3rd Edition, Update IIIB. Washington D.C.

Table 3-1. VOCs using USEPA Method 8260B quality control requirements and corrective actions.

Audit	Frequency	Control Limits	Corrective Action
Holding times	Samples must be analyzed within holding time.	Analyze within 7 days from collection for unpreserved aqueous samples and for vinyl chloride and styrene, and 14 days from collection for preserved aqueous samples.	<ol style="list-style-type: none">1. If holding times are exceeded for initial or any re-analyses required due to quality control (QC) excursions.2. Notify QAO since re-sampling may be required.3. Document corrective action in the case narrative.
GC/MS Instrument Performance Check	Once every 12 hours prior to initial calibration and calibration verifications. Analytical sequence must be completed within 12 hours of the GC/MS Instrument Performance Check	<ol style="list-style-type: none">1. Bromofluorobenzene (BFB) key ions and abundance criteria listed in the method must be met for all 9 ions and analyses must be performed within 12 hours of injection of the BFB.2. Part of the BFB peak will not be background subtracted to meet tune criteria.3. Documentation of all bromofluorobenzene analyses and evaluation must be included in the data packages.	<ol style="list-style-type: none">1. Tune the mass spectrometer.2. Document corrective action in the case narrative.3. Samples cannot be analyzed until control limit criteria have been met.

Table 3-1. VOCs using USEPA Method 8260B quality control requirements and corrective actions.

Audit	Frequency	Control Limits	Corrective Action
Initial Calibration	<p>Prior to sample analysis and when calibration verifications criteria are not met.</p> <p>Initial calibration will contain all target analytes in each standard.</p> <p>Quantitation of analyses will utilize the initial calibration results.</p>	<ol style="list-style-type: none"> Five concentrations bracketing expected concentration range for all compounds of interest. One second-source standard must be analyzed immediately following the initial calibration at the mid-calibration concentration. This standard must be within 30% recovery or within laboratory control limits. It is also recommended that a separate standard at the MDL level be analyzed after calibration is complete to check sensitivity. Minimum average response factor (RF) as listed in Method 8260B, with remaining min. avg. RFs factor ≥ 0.050 except for ketones with allowable min. avg. response factor ≥ 0.010. For compound with %RSD >15, quantitation must be performed using a separate calibration curve and the Coefficient of Determination (COD) must be ≥ 0.990. 	<ol style="list-style-type: none"> Identify and correct problem. If criteria are still not met, recalibrate. Document corrective action in the case narrative. Samples should not be analyzed until calibration control limit criteria are met. Contact QAO to discuss problem target analytes before proceeding with analysis.
Calibration Verification	<p>Every 12 hours, following BFB.</p> <p>The calibration verification will contain all target analytes in each standard at a concentration that is representative of the midpoint of the initial calibration.</p>	<ol style="list-style-type: none"> Within percent drift or percent difference (%D) of ≤ 20 for CCCs and $\leq 50\%$ for all non-CCC compounds. RF requirements are the same as listed in the initial calibration. The internal standards areas and retention times must meet the method criteria. 	<ol style="list-style-type: none"> Reanalyze. If criteria are still not met, identify and correct problem, recalibrate. Document corrective action in the case narrative; samples should not be analyzed until calibration control limit criteria are met.
Preparation Blank Analysis	<p>Every 12 hours, following calibration verification</p>	<p>Methylene chloride less than 3 times QL, 2-butanone and acetone less than 5 times QL. Remaining analytes less than QL. QLs and MDLs will be provided along with the preparation blank results.</p>	<ol style="list-style-type: none"> Reanalyze blank. If limits are still exceeded, clean instrument, recalibrate analytical system, and reanalyze all samples if detected for same compounds as in blank. Document corrective action in the case narrative - samples cannot be analyzed until blank criteria have been met.
Field/Equipment Blank Analysis	<p>Collected one per sampling event, or one per 10 samples or one per matrix (for less than 20 samples)</p>	<p>Methylene chloride less than 3 times QL, 2-butanone and acetone less than 5 times QL. Remaining analytes less than QL. QLs and MDLs will be provided along with the preparation blank results.</p>	<ol style="list-style-type: none"> Report results .

Table 3-1. VOCs using USEPA Method 8260B quality control requirements and corrective actions.

Audit	Frequency	Control Limits	Corrective Action
Trip Blank	1 per cooler containing VOC samples.	Methylene chloride less than 3 times QL, 2-butanone and acetone less than 5 times QL. Remaining analytes less than QL. QLs and MDLs will be provided along with the preparation blank results.	1. Report results .
Laboratory Control Sample Analysis	Each analytical batch (every 12 hours). Prepared independently from calibration standards. Spike must contain all target analytes and should be at a concentration, which is in the lower 1/2 of the calibration curve.	Recovery within laboratory control limits. For compounds without established laboratory control limits, 70-130% recovery will be used. The lowest acceptable control limits for recovery will be 10%.	1. If recovery failures are above control limits and these compounds are not detected in the associated samples, corrective action is not required. 2. If recovery failures are below control limits, reanalyze LCS and examine results of other QC analyses. 3. If other QC criteria have not been met, stop analysis, locate and correct problem, recalibrate instrument and reanalyze samples since last satisfactory LCS. 4. Document corrective action in the case narrative.
Internal Standards	All samples and blanks (including MS/MSD)	1. Response -50% - +200% of internal standards from continuing calibration of the day. 2. RT must be ± 30 sec. from associated calibration verification standard of that sequence.	1. Reanalyze. 2. If still outside of the limits, report both analyses. 3. Document corrective action in the case narrative.
Surrogate Spike	All samples and blanks (including MS/MSD)	Recovery within laboratory control limits. The lowest acceptable control limits for recovery will be 10%.	1. Reanalyze any environmental or QC sample with surrogates that exceed control limits. 2. If still outside of the limits, report both analyses. 3. Document corrective action in the case narrative.

Table 3-1. VOCs using USEPA Method 8260B quality control requirements and corrective actions.

Audit	Frequency	Control Limits	Corrective Action
<p>Matrix Spike/ Matrix Spike Dup. (MS/MSD) Analysis</p>	<p>Collected one per 20 samples or one per matrix (for less than 20 samples)</p> <p>Samples from the investigation must be used for MS/MSD analysis. If samples were not designated as MS/MSD samples, contact Project Manager upon receipt of samples at the laboratory.</p> <p>Spike must contain complete list of target analytes.</p>	<p>Recovery and RPD within laboratory control limits. For compounds without established laboratory control limits, 70-130% recovery will be used.</p> <p>The lowest acceptable control limits for recovery will be 10%.</p>	<ol style="list-style-type: none"> 1. If LCS criteria are met, document in case narrative; no additional corrective action required. 2. If LCS criteria are exceeded also, examine other QC data for source of problem; <i>i.e.</i>, surrogate recoveries for extraction efficiency and calibration data for instrument performance issues. 3. Reanalyze samples and associated MS/MSD and LCSs as required. 4. Document corrective action in the case narrative
<p>Field Duplicate Analysis</p>	<p>Collected one per each analytical group or one per matrix for each day of sampling</p> <p>Field duplicate will not be identified to the laboratory.</p>	<p>Validation criteria: 50% RPD for waters.</p> <p>For sample results that are less than or equal to five times the QL, the criterion of plus or minus two times the QL will be applied to evaluate field duplicates.</p>	<p>No corrective action required of the laboratory since the laboratory will not know the identity of the field duplicate samples. If these criteria are not met, sample results will be evaluated on a case-by-case basis.</p>

Table 3-1. VOCs using USEPA Method 8260B quality control requirements and corrective actions.

Audit	Frequency	Control Limits	Corrective Action
Target Analyte Identification	As required for identification of target analytes	<ol style="list-style-type: none"> 1. The intensities of the characteristic ions of a compound maximize in the same scan or within one scan of each other. Selection of a peak by a data system target compound search routine where the search is based on the presence of a target chromatographic peak containing ions specific for the target compound at a compound-specific retention time will be accepted as meeting this criterion. 2. The relative retention time (RRT) of the sample component is within ± 0.06 RRT units of the RRT of the standard component. 3. The relative intensities of the characteristic ions agree within 30% of the relative intensities of these ions in the reference spectrum. (Example: For an ion with an abundance of 50% in the reference spectrum, the corresponding abundance in a sample spectrum can range between 20% and 80%.) 4. Structural isomers that produce very similar mass spectra should be identified as individual isomers if they have sufficiently different GC retention times 5. Identification is hampered when sample components are not resolved chromatographically and produce mass spectra containing ions contributed by more than one analyte. When gas chromatographic peaks obviously represent more than one sample component (i.e., a broadened peak with shoulder(s) or a valley between two or more maxima), appropriate selection of analyte spectra and background spectra is important. 	Not applicable

Table 3-1. VOCs using USEPA Method 8260B quality control requirements and corrective actions.

Audit	Frequency	Control Limits	Corrective Action
Target Analyte Identification	As required for identification of target analytes	Examination of extracted ion current profiles of appropriate ions can aid in the selection of spectra, and in qualitative identification of compounds. When analytes co-elute (i.e., only one chromatographic peak is apparent), the identification criteria may be met, but each analyte spectrum will contain extraneous ions contributed by the coeluting compound.	Not applicable
Tentatively Identified Compound	If required, perform for each sample and blank analysis. Non-target compounds will be reported using a Mass Spectral Library search.	Not applicable	Not applicable
Dilutions	<ol style="list-style-type: none"> 1. When target analyte concentration exceeds upper limit of calibration curve. 2. When matrix interference is demonstrated by the lab and documented in the case narrative (highly viscous samples or a large number of nontarget peaks on the chromatogram). 3. It is recommended that a reagent blank be analyzed if an analyte saturates the detector or if highly concentrated analytes are detected. Otherwise data impacted from carryover cannot be used. 4. Laboratory will note in the data deliverables which analytical runs were reported. 	<ol style="list-style-type: none"> 1. The reagent blank will meet the method blank criteria. 	<ol style="list-style-type: none"> 1. Reanalyze reagent blank until method blank criteria are met. 2. Document corrective action in the case narrative.
pH Determination	Once sample analysis is complete, the pH of water samples must be determined.	Record pH and report in the case narrative.	Not applicable
Sample Batching	The laboratory will batch project samples together along with QC samples specified from the project. Non-project information will not be included in the data packages.	Not applicable	Not applicable
Laboratory control limits	Generated with results for an analyte from a minimum of 20 sample analyses. The average of the sample results and the standard deviation are calculated. The internal warning limits are established at 2 times the standard deviation and the control limits are established at 3 times the standard deviation. The control limits are updated annually.	Not applicable	Not applicable

Table 3-1. VOCs using USEPA Method 8260B quality control requirements and corrective actions.

Audit	Frequency	Control Limits	Corrective Action
Deliverables	<ol style="list-style-type: none"> 1. CLP-like deliverables must be provided to document each audit item for easy reference and inspection. 2. The calculation formula will be provided for each analysis, for each type of matrix in the data package. 3. Any laboratory abbreviations or notations presented in the raw data or summary information will be explained or referenced in the case narrative. 4. Final spiking concentrations will be presented in summary form. 5. Cooler temperatures and any observations of bubbles in sample containers will be provided in the data packages. 6. Run logs will be provided in the data packages. 	Not applicable	Provide missing or additional deliverables for validation purposes.
Method and QC Document requirements	The laboratory will perform the method as presented in this QC Document and will adhere to the QC Document requirements presented herein. Otherwise the laboratory will specifically note any procedures that differ from the method or the QC Document in the data package case narrative.	Not applicable	Not applicable

Notes:

Data validation will be performed in accordance with QA/QC criteria established in these tables and the analytical methods. Excursions from QA/QC criteria will be qualified based on guidance provided in this QCD.

Communications with the QAO will be documented and included in the data packages.

Source: O'Brien & Gere

Table 3-2 Metals using USEPA Methods 6010B and 6020 quality control requirements and corrective actions.

Audit	Frequency	Control Limits	Corrective Action
Holding Times	Samples must be digested and analyzed within holding time.	Metals: Analyze 180 days from collection.	<ol style="list-style-type: none"> 1. If holding times are exceeded for initial or any re-analyses required, notify the QAO immediately since re-sampling may be required. 2. Document corrective action in the case narrative.
Calibration Verification (ICV, CCV)	<p>Two point calibration for ICP consisting of one standard and one blank. Calibrate each time instrument is set up.</p> <p>After calibration, Initial calibration verification (ICV) is performed. The ICV is from a source independent of the calibration standards.</p> <p>A continuing calibration verification (CCV) is analyzed at the beginning of the run, at 10% or every 2 hours. Also verify at the end of each run.</p>	ICV, CCV - 90% to 110% of expected value.	<ol style="list-style-type: none"> 1. Reanalyze. 2. If criteria are still not met, identify and correct problem, recalibrate. 3. Document corrective action in the case narrative - samples cannot be analyzed until calibration control limit criteria have been met.
ICP/MS tuning, mass calibration and resolution checks	Analyze tune solution at least 4 times after the instrument has equilibrated prior to sample analysis. Evaluate mass calibration and resolution checks in the mass regions of interest. Solution contains elements representing all the of mass regions of interest (such as Li, Co, In, Tl) to verify resolution and mass calibration within criteria.	<ol style="list-style-type: none"> 1. RSD must be <15% for analytes in the tune solution, with 200 continuous scans. 2. If mass calibration is >0.1amu from the true value, mass calibration must be adjusted to correct values. 3. Resolution must be less than 0.9amu of full width at 10% of peak height. 4. Provide documentation of mass calibration and resolution evaluations in the data package. 	<ol style="list-style-type: none"> 1. Identify and correct problem, and retune instrument - samples cannot be analyzed until tune criteria is met.

Table 3-2 Metals using USEPA Methods 6010B and 6020 quality control requirements and corrective actions.

Audit	Frequency	Control Limits	Corrective Action
<p>ICP/MS Initial and continuing calibration verification (ICV, CCV)</p>	<p>Two point calibration at a minimum for ICP/MS consisting of a calibration blank and at least one initial calibration standard. Calibration standard solutions must contain appropriate internal standard for each target element. Calibration solution must be initially verified using a QC standard and monitored weekly for stability. The initial calibration verification (ICV) must be prepared in the same matrix as the calibration standards but as a independent standard near the midpoint of the linear range at a concentration other than the calibration standards. Verify calibration with ICV, ICB immediately after calibration. Verify with CCV, CCB at frequency of every 10 samples and at the end of the sequence. Std. at or below the RL should be analyzed after initial calibration for cyanide. For ICP/MS, prior to preparing standards, each stock solution should be analyzed separately to determine any interferences.</p>	<p>ICV, CCV must be 90% to 110% of expected value for ICP/MS, and cyanide. If the ICP/MS is resloped or recalibrated after the ICV is analyzed, a new CCV, CCB must be analyzed prior to sample analysis. Provide documentation of calibration standard monitoring and evaluation.</p>	<ol style="list-style-type: none"> 1. Reanalyze. 2. If criteria are still not met, terminate analysis, identify and correct problem, recalibrate, and contact QAO*. 3. Document corrective action in case narrative - samples cannot be analyzed until calibration control limit criteria have been met.

Table 3-2 Metals using USEPA Methods 6010B and 6020 quality control requirements and corrective actions.

Audit	Frequency	Control Limits	Corrective Action
Internal Standard for ICP/MS	<p>Appropriate internal standard as listed in Method 6020 is required for each analyte. The internal standard should be no more than 50 amu from the target element.</p> <p>Recommended internal standards include 6Li, 45 Sc, 89Y, 103 Rh, 115In, 159Tb, 169Ho, 209Bi.</p>	<p>Intensity of all internal standards must be monitored for every analysis.</p> <p>The intensity of any internal standard must be >30% or <120% of the intensity of the internal standard in the initial calibration standard.</p> <p>Document internal standard intensity and the evaluation for each analysis performed and include in the data package.</p>	<ol style="list-style-type: none"> 1. If sample analysis fails, dilute the sample fivefold (1+4), adjust internal standard and reanalyze. 2. Repeat until internal standard intensity meets criteria. 3. If the CCB or CCV intensity fails, terminate analysis, identify and correct problem, recalibrate, verify calibration and reanalyze samples, document in the case narrative, and contact QAO*.
CRDL Standard for ICP (CRI) and ICP/MS	<ol style="list-style-type: none"> 1. For ICP and ICP/MS CRI is the QL concentration at the beginning and end of each run for all elements 2. The CRI shall be run for every wavelength used for analysis, except those for Al, Ba, Ca, Fe, Mg, Na, and K. 	<p>The percent recovery of the CRI must meet the control limits of 50-150%.</p>	<ol style="list-style-type: none"> 1. The CRI shall be re-analyzed immediately for those analytes; if the results of the re-analysis for those analytes fall within the control limits, no further corrective action is required. 2. If the results of the re-analysis for those analytes do not fall within the control limits, the analysis shall be terminated, the problem corrected, the instrument recalibrated, the CRI analyzed, and the samples associated with the CRI re-analyzed. 3. Document corrective action in case narrative.
Initial and Continuing Calibration Blank (ICB/CCB)	<p>After ICV, CCV, at beginning and end of run and at a rate of 10% or every 2 hours during run.</p>	<p>The absolute value of the ICB and CCB must not exceed the QL.</p>	<ol style="list-style-type: none"> 1. Identify and correct problem. 2. If criteria are still not met, recalibrate and reanalyze affected samples. 3. Document corrective action in the case narrative - samples cannot be analyzed until blank control limit criteria have been met.
Preparation Blank Analysis	<p>1 per batch of samples digested, or 1 in 20, whichever is greater.</p> <p>PB shall be carried through the complete procedure and contain the same acid concentration in the final solution as the sample solution used for analysis.</p>	<ol style="list-style-type: none"> 1. The absolute value of the method blank must not exceed the QL. 	<ol style="list-style-type: none"> 1. Reanalyze blank. 2. If limits are still exceeded, clean instrument and recalibrate analytical system and re-preparation and reanalyze affected samples if detected. 3. Document corrective action in the case narrative - samples cannot be analyzed until blank criteria are met.

Table 3-2 Metals using USEPA Methods 6010B and 6020 quality control requirements and corrective actions.

Audit	Frequency	Control Limits	Corrective Action
Rinse Blanks	Flush ICP/MS between all samples and standards, including all calibration standards.	Flush until the signal levels return to the detection limit level before analysis of samples.	Repeat analysis using correct application of rinse blanks.
Field / Equipment Blank Analysis	Collected one per 10 samples or one per day for each matrix.	Less than QL	<ol style="list-style-type: none"> 1. Investigate problem. 2. Document in the case narrative.
Laboratory Control Sample Analysis	<p>Every 20 samples or each digestion batch.</p> <p>Prepared independently from calibration standards.</p>	<p>Recovery within laboratory control limits.</p> <p>The lowest acceptable control limits for recovery will be 10%.</p>	<ol style="list-style-type: none"> 1. Reanalyze LCS and examine results of other QC analyses. 2. If recovery is still outside limits, and other QC criteria are met, report both runs. 3. If other QC criteria have not been met, stop analysis, locate and correct problem, recalibrate instrument and reanalyze samples since last satisfactory LCS. 4. Document corrective action in the case narrative.
Serial Dilution Analysis for ICP	<p>Every 20 samples or each digestion batch.</p> <p>Required when for target analytes with concentration is >10 times the IDL (or MDL if applicable).</p>	An analysis of a 1:5 dilution of the sample should provide a result with 90% to 110% of the original determination (for concentrations 10x the IDL (or MDL if applicable)).	<ol style="list-style-type: none"> 1. Report results. 2. Document corrective action in the case narrative.
Serial Dilution Analysis for ICP/MS	<p>Every 20 samples or each digestion batch.</p> <p>Required when analyte concentration is >100 times the reagent blank and is within the linear range of the ICP/MS.</p> <p>Performed for every 20 samples for each matrix or per batch.</p>	An analysis of a 1+4 dilution of the sample should provide a result with 90% to 110% of the original determination for concentrations 100X the IDL for the ICPMS).	<ol style="list-style-type: none"> 1. Qualify data. 2. Document corrective action in the case narrative.

Table 3-2 Metals using USEPA Methods 6010B and 6020 quality control requirements and corrective actions.

Audit	Frequency	Control Limits	Corrective Action
Interference Check Sample Analysis for ICP	<p>Beginning and end of each analytical run or twice during every 8 hours, whichever is more frequent for ICP.</p> <p>Solution A consists of the interferences, and Solution AB consists of the analytes mixed with the interferences.</p>	<p>Results for the ICS Solution AB (ICSAB) during the analytical runs shall fall within the control limit of ± 2 times the QL of the true value or $\pm 20\%$ of the true value, whichever is greater, for the analytes included in the ICSAB</p>	<ol style="list-style-type: none"> 1. Reanalyze. 2. If limits are still exceeded, adjust instrument. 3. Restart analytical run and reanalyze samples analyzed since last satisfactory ICS. 4. Document corrective action in the case narrative.
Interference Check Sample Analysis for ICP/MS	<p>Beginning of each analytical run or once during every 12 hours, whichever is more frequent for ICP/MS. For measurement of elemental, molecular-ion isobaric interference corrections. ICSA/ICSAB contains known concentration of interfering elements that will demonstrate the magnitude of the molecular-ion isobaric interferences to verify that the interferences are corrected by the data system within the control limits.</p>	<p>Percent recovery of all elements must be within current laboratory control limits. Document the ICSA/ICSAB evaluations and include in the data package.</p>	<ol style="list-style-type: none"> 1. Reanalyze. 2. If limits are still exceeded, adjust interference corrections for instrument; samples cannot be analyzed until ICSA/ICSAB control limit criteria have been met. 3. Restart analytical run and reanalyze samples analyzed since last satisfactory ICS. 4. Document corrective action in the case narrative.
Matrix Spike Analysis	<p>1 per group of similar concentration and matrix, 1 per case of samples, or 1 in 20, whichever is greater.</p>	<p>Recovery within laboratory control limits or 75-125%. Recovery does not apply if sample concentration > 4 X spike concentration.</p> <p>Spike must contain all analytes.</p> <p>The lowest acceptable laboratory control limits for recovery will be 10%.</p>	<ol style="list-style-type: none"> 1. Analyze post-digestion/post-distillation spike at two times the QL or two times the indigenous level, whichever is greater. For biota, a post digestion/post-distillation spike at the same concentration as the LCS will be performed. 2. Document corrective action in the case narrative.

Table 3-2 Metals using USEPA Methods 6010B and 6020 quality control requirements and corrective actions.

Audit	Frequency	Control Limits	Corrective Action
Post-Digestion Spike	Spike must contain all target elements. Performed every 20 samples as necessary.	Recovery within 75-125% of true value.	1. Document in the case narrative.
Laboratory Duplicate or Matrix Spike Duplicate Analysis	1 per group of similar concentration and matrix, 1 per case of samples, or 1 in 20, whichever is greater.	Laboratory control limit or 20% for RPD shall be used for original and duplicate sample values greater than or equal to five times the QL. A control limit of the QL value shall be used if either the sample or duplicate value is less than five times the CRQL.	1. Document in the case narrative.
Field Duplicate Analysis	Collected 1 per each analytical group or one per matrix for each day of sampling	Validation criteria: 100% RPD for soils. For sample results that are less than or equal to five times the QL, the criterion of plus or minus two times the QL will be applied to evaluate field duplicates.	No corrective action required of the laboratory since the laboratory will not know the identity of the field duplicate samples. If these criteria are not met, sample results will be evaluated on a case-by-case basis.
Laboratory control limits	1. Generated with results for an analyte from a minimum of 20 sample analyses. The average of the sample results and the standard deviation are calculated. The internal warning limits are established at 2 times the standard deviation and the control limits are established at 3 times the standard deviation. The control limits are updated annually.	Not applicable	Not applicable

Table 3-2 Metals using USEPA Methods 6010B and 6020 quality control requirements and corrective actions.

Audit	Frequency	Control Limits	Corrective Action
IDL Determination for ICP	Within 30 days of the start of analysis and semiannually. Instrument Detection Limits (IDLs) are established by DCL through evaluation of initial and continuing calibration blanks. IDLs are calculated by taking the standard deviation of a series of twenty separate analytical determinations of the calibration blanks. The concentration of the IDL for a given analyte will be less than or equal to the concentration of the associated MDL.	Not applicable	Not applicable
IDL Determination for ICP/MS	Quarterly Instrument Detection Limits (IDLs) are established by DCL through evaluation of initial and continuing calibration blanks. IDLs are calculated by taking the standard deviation of a series of twenty separate analytical determinations of the calibration blanks. The concentration of the IDL for a given analyte will be less than or equal to the concentration of the associated MDL.	Not applicable	Not applicable

Table 3-2 Metals using USEPA Methods 6010B and 6020 quality control requirements and corrective actions.

Audit	Frequency	Control Limits	Corrective Action
MDL Determination	Before any field samples are analyzed, the MDLs shall be determined for non-prepared analyses, each digestion procedure and instrument used, prior to the start of analyses, and annually thereafter.	Not applicable	Not Applicable
System Operation for ICP/MS	Use an average of 3 integrations for both the calibration and sample analysis. All masses which could affect data quality will be monitored to determine the potential effect from the matrix. Isotopes listed in the method should be used. not applicable	Not applicable	Repeat analysis using correct application of system operation.

Table 3-2 Metals using USEPA Methods 6010B and 6020 quality control requirements and corrective actions.

Audit	Frequency	Control Limits	Corrective Action
Interference monitoring for ICP/MS	<p>The analyst is required to monitor potential sources of interferences by measuring the elements of interest or a molecular species that may indicate the presence of an interferent and by taking appropriate action to ensure data of known quality. Interferences must be corrected by using correction equations based on observed isotopic signals and by monitoring the intensity of the internal standards. Samples exhibiting isobaric elemental interferences (isotopes of different elements with similar mass to charge ratio or very high ion currents at adjacent masses) require resolution improvement, matrix separation, or alternate isotopes. The rinse period between samples must be long enough to eliminate significant memory interferences. 5. Extensive QC for interference corrections must be performed. not applicable</p>	Not applicable	Repeat analysis using correct application of interference monitoring.
Linear Range Analysis for ICP	Every 6 months.	Not applicable	Not applicable
Interelement Correction For ICP	<p>Within 6 months of the start of analysis and annually. Correction factors for Al, Ca, Fe, and Mg must be reported and for others if they are applied.</p>	Not applicable	Not applicable

Table 3-2 Metals using USEPA Methods 6010B and 6020 quality control requirements and corrective actions.

Audit	Frequency	Control Limits	Corrective Action
Analyte quantitation	Concentrations for ICP/MS, cyanide and mercury analysis are reported based on dry weight of the sample. Calculations for the ICP/MS should include appropriate interference corrections, internal standard normalization, and summation of signals at 206, 207, and 208 mass to charge for lead. All QC criteria must be met when applying correction equations. If interference is detected, elements impacted are flagged to indicate percentage interference correction applied to the data or an uncorrected interference because of the equation used for quantitation.	Not applicable	Not applicable Repeat analysis using correct application of analyte quantitation
Dilutions for ICP/MS	Analyze samples at a 1:5 dilution. Dilute and reanalyze samples with concentrations that are still greater than the linear range of the instrument. The laboratory will note in the data package which analytical runs were used to report the sample results.	Not applicable	Repeat analysis using correct application of dilutions.
Sample Batching	The laboratory will batch project samples together along with QC samples specified from the project. Non-project information will not be included in the data packages.	Not applicable	Not applicable

Table 3-2 Metals using USEPA Methods 6010B and 6020 quality control requirements and corrective actions.

Audit	Frequency	Control Limits	Corrective Action
Dilutions	1. When target analyte concentration exceed upper limit of calibration curve. 2. When matrix interference demonstrated by lab and documented in the case narrative. 3. Laboratory will note in the data deliverables which analytical runs were reported.	Not applicable	Not applicable
Deliverables	1. CLP-like deliverables must be provided to document each audit item for easy reference and inspection. 2. An example calculation will be provided for each analysis, for each type of matrix in the data package using samples from the project. 3. Any laboratory abbreviations or notations presented in the raw data or summary information will be explained or referenced in the case narrative. 4. Final spiking concentrations will be presented in summary form. 5. Standard tracing information will be provided. 6. Cooler temperatures will be provided in the data packages. 7. Run logs will be provided in the data packages.	Not applicable	Provide missing or additional deliverables for validation purposes.

Table 3-2 Metals using USEPA Methods 6010B and 6020 quality control requirements and corrective actions.

Audit	Frequency	Control Limits	Corrective Action
Method and QCD requirements	The laboratory will perform the method as presented in this QCD and will adhere to the QCD requirements presented herein. Otherwise the laboratory will specifically note any procedures that differ from the method or the QCD in the data package case narrative.	Not applicable	Not applicable

Note
Data validation will be performed in accordance with QA/QC criteria established in these tables and the analytical methods. Excursions from QA/QC criteria will be qualified based on guidance provided in this QCD.
Communications with the QAO will be documented and included in the data packages.
Source: O'Brien & Gere

MDEQ Correspondences



**Remediation and Liability
Management Company, Inc.**

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August 16, 2006

Mr. James E. Innes
Michigan Department of Environmental Quality
Remediation and Redevelopment Division
Constitution Hall
525 West Allegan Street
Lansing, MI 48909

Re: Hemphill Landfill Site
Flint, Michigan

Dear Mr. Innes:

This letter is written to inform you of our response activities intended to evaluate and address environmental conditions at the GM Burton Parcel, which is a part of the Hemphill Landfill (Site) located in Burton, Michigan. As you know, there have been multiple owners who conducted different operations in different parts of the Site. Currently, we are in the process of gathering and evaluating Site information in order to identify the most effect approach which would result in the submittal of a remedial action plan.

Remediation and Liability Management Company, Inc. (REALM), a wholly owned subsidiary of General Motors Corporation, plans to submit a brief Work Plan (for Michigan Department of Environmental Quality (MDEQ) review) to perform investigation work associated with assessing ground water flow conditions on the REALM portion of the Site, known as the Burton Parcel as outlined on Figure 1. The collection of this additional data is intended to provide information to better understand ground water flow conditions and evaluate potential future investigation. The Site remediation strategy at this time includes evaluating options for achieving either a Generic or Limited Commercial/Industrial Closure and evaluating remedial actions appropriate to mitigate potential migration pathways associated with REALM's potential liability.

At our meeting held on February 9, 2006, the MDEQ requested REALM provide the names of potentially responsible parties associated with placing waste materials in the Hemphill Landfill. While it is not REALM's responsibility to gather liability information on other parties, we had previously identified several different owners and/or operators. Based on our previous research, specifically the Proceedings of the Board of Supervisors of Genesee County (1940 through 1944) there is documentation indicating the City of Burton owned the Hemphill Landfill and leased the property to individuals

who were allowed to place fill material in low lying areas on the property. The Proceedings for the April 25, 1941 meeting indicate the City of Burton leased the property to an individual who was to start to fill the land within 15 days of signing the lease. He was to continue filling the area for the duration of the lease (5 yrs). According to the October 5, 1943 Proceedings, the City of Burton leased the property to an individual who was able to claim articles that he may salvage and he was to bury dead animals at a sufficient depth to meet sanitary requirements. Waste disposed at the Site was likely generated by local residents and businesses. The City of Burton would be considered an owner, operator and generator at the Site.

Another party who has conducted activities at the Site is the Genesee County Drain Commission, which constructed and operates a surface water control facility and drainage conveyances on a portion of the Site. They are an owner and operator of a portion of the Site and have, at a minimum, due care obligations.

In addition, Mr. Robert E. Brown II (3029 Ponemah Fenton, Michigan 48430) is the current property owner of the parcel (PID# 25-59-29-300-010) located east of the GM property and Flint Investment LLC (37622 Jonquil Court Westland, Michigan 48185) is the current property owner of the parcel (PID #59-29-551-026) located south of the REALM property. A figure depicting these properties in relation to the REALM owned property is attached as Figure 1. As owners of potentially contaminated property they may have potential liability for investigating and remediating the historic land filling of the parcels. They also have due care responsibilities.

Finally, it is our understanding the Sunoco Service Station (Site # 00018528) located adjacent to the east of the Hemphill Landfill reported a release (Incident number C-1002-00) on December 28, 2000. A Notice to Impacted Parties of Corrective Action form (EQP 3852) was submitted to the City of Burton and the Genesee County Road Commission on June 22, 2001. However, analytical results reported in the Burton Parcel Additional Investigation Report dated March 2001 (provided to the MDEQ in March 2001), indicates concentrations of benzene in soil, and concentrations of benzene, ethylbenzene, xylenes and dissolved lead in ground water are above the MDEQ Generic Residential criteria at soil boring locations on the Burton Parcel in close proximity to the Sunoco Service Station. It is likely these concentrations are associated with the reported release at the Sunoco Service Station. REALM has not been notified regarding potential investigation at the REALM property to assess the extent of impact to soil and ground water, or intention of the owner/operator to cleanup potential impact at the REALM property. We request you provide information on the status of this open release site.

REALM will work with the MDEQ to address the environmental conditions associated with the GM Burton Parcel, but believe addressing the entire Site will need the involvement of other parties as well. We hope that MDEQ will be instrumental in notifying and coordinating with the various parties to ensure all of the necessary work is

Mr. James E. Innes
August 16, 2006
Page 3

properly apportioned. If you have any questions or would like additional information, please contact me at 248-753-5702.

Sincerely,



David Worrell, P.E.
Project Manager
General Motors Corporation / REALM

cc: Tony Finch - O'Brien & Gere Engineers, Inc., Farmington Hills, MI



JENNIFER M. GRANHOLM
GOVERNOR

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING DISTRICT OFFICE



STEVEN E. CHESTER
DIRECTOR

September 18, 2006

SEP 22 10:00 AM '06

Mr. David Worrell, P.E.
Remediation and Liability Management Company, Inc.
PCC Central
Mail Code 483-520-190
2000 Center Point Parkway
Pontiac, Michigan 48341-3147

Dear Mr. Worrell:

SUBJECT: Hemphill Landfill, a.k.a. The Burton Parcel, Genesee County
Facility ID 25000686

The Department of Environmental Quality (DEQ) has completed a review of your August 16, 2006, correspondence.

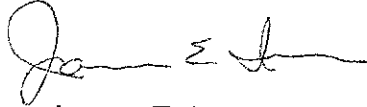
The DEQ looks forward to receipt of your work plan for assessing groundwater.

Feel free to forward information you have concerning other potentially responsible parties. Any documentation that assists the DEQ in determining liability will be greatly appreciated. Please note, however, that under Section 29 of Part 201 of the Natural Resources and Environmental Protection Act, Act 451 of 1994, as amended, it is the responsibility of the party asserting a division of harm to prove it is divisible. If measurable divisibility is beyond proof then, by statute, the State may hold a liable party responsible for the entirety of the harm. Liability in this matter is joint and severable, so any decision by the DEQ to hold one party responsible does not preclude that party from seeking compensation from other parties that may also have liability.

In regard to the leaking underground storage tank site, ID# 18528, located at G-3311 S. Saginaw, the Remediation and Liability Management Company, Inc. is not responsible for contamination migrating onto its property from an off site source. The DEQ project manager for this site is Mr. Dwight Cummings. For further information regarding site #18528 please contact Mr. Cummings at 517-335-6242.

Please submit the work plan for groundwater assessment at the Burton Parcel to my attention at the address below. Feel free to contact me if you have any questions.

Sincerely,

A handwritten signature in black ink, appearing to read "James E. Innes". The signature is fluid and cursive, with a large initial "J" and a long horizontal stroke at the end.

James E. Innes
Lansing District Office
Remediation and Redevelopment Division
517-335-6241

JEI:JJM

cc: Mr. Anthony Finch, O'Brien & Gere
Mr. Dwight Cummings, DEQ

**O'Brien & Gere Rotosonic® Drilling
Protocol**

ROTONSONIC DRILLING PROTOCOL

PREPARATION

Prior to commencing daily drilling activities the driller will inspect the drilling rig for proper operation. The driller will take care in positioning the drill rig such that the rig is not unstable during drilling operations.

Sonic Drilling

A SONIC drill rig looks and operates very much like any conventional top-drive rotary or auger rig. The SONIC drilling system employs simultaneous high frequency vibration and low speed rotational motion along with down pressure to advance the cutting shoes of the drill string. This technique provides a continuous soil core and generates minimal cuttings.

Drilling operations take place from the drill platform, which is about 4 feet above ground. Steel drill casing and core barrel are connected to the head from the work platform/support truck and are then hoisted to vertical in the derrick. Tool joints are connected and broken by a hydraulic vise/wrench that is in the base of the derrick. The SONIC head is able to pivot 90 degrees making connection of the rods easier and cleaner.

The SONIC drilling system uses an override core barrel system. A 4- or 6-inch diameter 10 or 20-foot long core barrel is first advanced 10 feet into the ground. This is followed by the override casing drilled to the same depth as the core barrel cutting shoe. The core barrel is then removed and two to four, 5-foot cores are extruded into plastic sleeves. The core barrel is sent back down the hole where it is advanced another 10 or 20 feet followed again by the override casing. The outer casing prevents cross contamination and formation mixing and allows for a very controlled placement of wells or downhole instrumentation.

Due to the true continuous sampling of the system, accurate depictions of the stratigraphy and lithology of the overburden are obtained (minimal sloughing). Additionally, few cuttings are mobilized to the surface. Most of the formation material enters the core barrel, except small amounts, that are pushed into the borehole wall.

If a confining layer is encountered during drilling, a second and third SONIC override casing may be installed. The double override casing system consists of installing a 6- or 8-inch diameter casing around the standard override casing, which in turn encloses the core barrel. The SONIC double override casing system works on the same principles as the permanent telescoping wells, grouting and sealing confining layers as the well is set. See the attached flyer for more detail on the SONIC override casing system.

Cuttings and fluids will be containerized pending characterization and appropriate disposal.

**O'Brien & Gere Low-Flow
Groundwater Sampling Protocol**

LOW FLOW PURGING GROUND WATER SAMPLING PROTOCOL

Low Flow Sampling Protocol (Ground Water Sampling)

PREPARATION

Prior to commencing daily sampling activities all ground water quality monitoring equipment shall be field checked in accordance with the manufacturers specifications. Results of field checks will be recorded in the field log notebook.

The depth of wells and well screened intervals will be acquired from site specific drilling logs or existing monitoring well specification tables. This data (and source of data) will be pre-recorded on the Ground Water Field Sampling Log.

Ground Water Elevation Measurements

A complete round of ground water elevations should be measured in each site well to be sampled prior to commencing ground water sampling activities. Care shall be taken to disturb only the upper portion of the well water column to avoid re-suspension of settled solids in the wells. Ground water elevation measurements will be taken as follows:

1. Identify the well and record the location on the Ground Water Field Sampling Log.
2. Put on a new pair of disposable gloves.
3. Using an electric well probe, measure the depth to water table.
4. Decontaminate the well probe in accordance with methods described in the QAPP.

Sampling Procedures

1. Identify the well and record the location on the Low Flow Ground Water Field Sampling Log. Review well depth, depth to water, and screened interval data.
2. Put on a new pair of disposable gloves.
3. Clean all meters, tools, and equipment before placing on the plastic sheet.
4. Prepare the submersible pump for operation. The pump discharge tubing should be new or dedicated teflon or teflon coated polyethylene. Connect the tubing to the in-line water quality indicator parameter meter.
5. Slowly and carefully lower the sampling pump and associated equipment into the well. The objective is to minimize mixing of the stagnant water above the screened interval with the water within the interval and avoid re-suspension of fines within the well. Position the pump intake in the center of the screened interval.

LOW FLOW PURGING GROUND WATER SAMPLING PROTOCOL

6. Commence well purging by low flow pumping from the well. The flow rate shall not exceed 0.5 liters/min. Record purge rate on the Ground Water Field Sampling Log.
7. During purging, monitor and record pH, specific conductivity, temperature, oxidation-reduction potential (redox), and turbidity approximately every three minutes from the in-line monitor and turbidity meter.
8. Record water levels periodically during purging, to ensure that drawdown is not occurring. Should drawdown be occurring, reduce pumping rate and re-check for drawdown on a periodic basis.
9. Well sampling can commence after equilibration of water quality parameters. Equilibration is defined as three consecutive readings within 10% of each other or a minimum of 30 minutes of pumping. Record total volume of water purged and purging time on the Ground Water Field Sampling Log for future reference.
10. Pumping rates should, if needed, be reduced to the minimum capabilities of the pump to avoid pumping the well dry and/or allow stabilization of indicator parameters. If recharge rate of the well is very low and the well is purged dry, then sampling should commence as soon as the well has recharged to a sufficient level to collect the appropriate volume of samples. Sample collection using bailing techniques may be used in this situation. However, turbidity levels shall be maintained as low as possible.
11. Remove the sampling bottles from their transport containers, and prepare the bottles for receiving samples. Inspect all labels to insure proper sample identification. Sample bottles should be kept cool with their caps on until they are ready to receive samples. Arrange the sampling containers to allow for convenient filling. Always fill the containers labeled purgeable priority pollutant first.
12. After the last sample has been collected, record the date and time.
13. Begin the Chain of Custody documentation.
14. Remove the submersible pump from the well and decontaminate the pump both internally and externally. Associated pump wiring shall be rinsed with decontaminating fluids as well. Decontamination will be performed by the following procedure:
 - Pump solution (approximately five gallons) of potable water and non-phosphate detergent through pump.
 - Pump clean potable water through pump.
 - Pump distilled/deionized water through pump.
 - Return the pump to its covered storage box.
15. Replace the well cap, and lock the well protection assembly before leaving the well location.

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